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The New President of the Institute

Charles F. Rand, who has been elected president of the American Institute of Mining Engineers, received the compliment of a unanimous vote, which is particularly gratifying inasmuch as there were several tickets in the field for secretary and at least two for directors.

Mr. Rand was born at Canaan, Maine, in 1856. After completing his education, his first active business was as auditor and treasurer of the Milwaukee, Lake Shore & Western Railway Co. He severed his connection with this road in 1886, at which time he went into iron mining, continuing until 1905 the executive officer and manager of the Aurora Iron Mining Co., of Ironwood., Michigan. He had charge likewise of half a dozen other iron mines in the Michigan iron ranges.

CHARLES F. RAND

During this time, he was called upon to be receiver of two important iron companies, which he reorganized and placed upon their feet, and in whose management he was active until their absorption in 1905 by the Carnegie Steel Co.

Mr. Rand's principal business during later years has been in connection with iron and manganese mining in Cuba. Since 1893 he has been the president and general manager of the Spanish-American Iron Co., operating in Santiago de Cuba, having just completed his 20th year as its president. During this period, he has built railroads, constructed harbors, electric power and sintering plants and built two model towns, with the result that the mines which are controlled by Mr. Rand in Cuba have become famous not only for equipment and efficiency of operation, but also for the care exercised in the housing and protection of laborers.

Mr. Rand has not only been interested and actively responsible for the management of iron and manganese properties, but his name is associated with the development or operation of important enterprises on the Pacific Coast. He was an executive officer of the Monte Cristo mines in the State of Washington and of the Puget Sound Reduction Co., which owned and operated the smelting works at Everett, Wash., and in 1902 he organized the Federal Mining & Smelting Co., operating in the Cœur d'Alenes.

Mr. Rand is a member of the Chamber of Commerce of New York, the American Iron and Steel Institute, the Iron and Steel Institute of Great Britain and several other technical societies.

During his term as director of the American Institute of Mining Engineers, he has been most active and efficient, and as chairman of the finance committee has been largely responsible for the present satisfactory condition of Institute finances and for economies, in which he has been enthusiastically followed by the officers and fellow directors of the last two years.

Mr. Rand comes of the family which created the Rand rock drill, one of the most famous of mining machines, the company exploiting which was finally merged in the Ingersoll-Rand company. In his own mining career he has been identified with large operations, especially his latest ones in Cuba, which are conducted upon a huge scale and have been the subject of several papers in the transactions of the Institute. Mr. Rand's personal activities have always been exerted on the executive side and the Institute is fortunate in electing to its presidency a man of such well proved executive ability. The kind of service that he can render has already been well demonstrated during his time on the board of directors. Mr. Rand is personally popular with everybody, a man of the world who has no rough corners, and under him the affairs of the Institute will surely be conducted smoothly and constructively. It is evident that the long succession of distinguished and successful presidents of the Institute is to be continued for another year at least and there is every reason to expect that the unpleasant discords of the last few months will be eliminated.

New Mine and Metallurgical Construction

Sloss-Sheffield Steel & Iron Co.—Plans are being matured for new coal and ore washers for this company's properties in Alabama, which, it is estimated, will cost about $500,000.

Empire Zinc Co.—A zinc-copper ore concentrator is being planned by this company, to be built at Tucson, Ariz.

Max Delta Mining Co.—This company, operating a mine near Phœnix, Ariz., has been considering the advisability of building a small mill.

Bagdad Copper Co.—A railroad is to be built by this company to connect Seligman and Bouse, Ariz., thus affording transportation facilities for its copper mines, of which Lewis A. Wright is manager.

Gold Hill Mining Co.—A 5-stamp mill is being built for this company, at Lewiston, Trinity County, Calif.; Samuel Williams, superintendent.

Idaho-Continental Co.—The machinery for this company's mill, at Porthill, is being assembled for installation.

Diamond Hitch—A stamp mill and cyanide plant will be built this spring at this mine, in the Oro Grande district, Idaho; Orrin Lamb, owner.

Yellow Jacket—At this mine, near Hailey, Idaho, a 50-ton cyanide plant for the treatment of tailings was expected to be ready for operation Feb. 15.

Ray-Jefferson Co.—A small compressor plant will be equipped by this company, operating in the Sunset Peak district, Shoshone County, Idaho.

National Copper Mining Co.—This company will build a 100-ton concentrator at its mine, near Wallace, Idaho.

Elk Gold Mining & Milling Co.—This company, operating a gold mine in Idaho County, Idaho, has been doing development work for six years, and a mill for the property is now being planned.

Interstate-Callahan Mining Co.—This company will build a 300-ton mill at Wallace, Idaho.

Martha Ball Mining Co.—This company is erecting a concentrator of 300 tons daily capacity on the land of the Liberty Mining Co., in the Chitwood zinc-lead district, at Joplin, Mo.; the mill will be electrically driven and is the second of its type to be built on the Liberty company's property.

Broadway Gold Mining Co.—A hoisting and pumping plant is being equipped at this company's mine, at Silver Star, Madison County, Mont. The shaft will be extended from the 260- to the 850-ft. level, and later a 100-ton stamp mill and cyanide annex will be erected.

Bullwhacker Copper Co.—It is reported that the capacity of the 50-ton copper-ore leaching plant, near Butte, will be increased to 250 tons per day.

Pioneer Consolidated Mines Co.—This company, of Pioneer, Nev., has bought the 10-stamp mill built for North Bros., at Beatty, and will reërect it at the Pioneer mine; a cyanide annex may be added; W. J. Tobin, president.

Sunset Mining & Development Co.—A mill of 5000 tons monthly capacity is contemplated at this company's Tramp mine, at Rhyolite, Nev.

Balbach Smelting & Refining Co.—This company has begun the construction of a new lead refinery of 50,000 tons annual capacity, which will take the place of the present plant on the company's Newark Bay property, Newark, N. J.

Carson-Dodson Mining Co.—A concentrator of 400 tons capacity per 10-hr. shift is being built by this company, at an estimated cost of $25,000, on a 20-acre lease of the Emma Gordon land, at Miami, Okla.; power will be developed by gas engines.

Black Eagle—A small concentrator for the treatment of copper ores is being built at this mine, at Mehama, Marion County, Ore.

Ogle Mountain Mining Co.—A 100-ton cyanide plant will be built at this company's mine, in Clackamas County, Ore., early this spring. Charles F. Spaulding, of Denver, designed and will build and superintend the operation of the plant. The business office of the company is at Oregon City.

Aluminum Co. of America—The Stone & Webster Engineering Co., of Boston, has been awarded the contract for building a new reduction plant at Kensington, Penn.

Bismarck Mining Co.—A new 300-ton cyanide plant was completed and its operation begun early in January by this company, operating at Flatiron, S. D.

Consolidated Gold Mines & Refining Co.—This company is building a 6-stamp mill with concentrators and cyanide annex at the Golden Eagle mine, in the Blewett district, Chelan County, Wash.

El Oro Mill Co.—A 200-ton mill will be built by this company at Republic, Wash., at an estimated cost of $60,000. The site is near the Hope mine, and N. C. Titus, consulting engineer for the Mabry properties, designed the mill and will have charge of its construction; work will begin as soon as the weather permits.

Pearl Lake Gold Mines, Ltd.—A 30-stamp mill in Nova Scotia has been bought for erection on this company's property, at Porcupine, Ont.

McEnaney—This Cobalt property, owned by the Crown Reserve company, has begun the operation of its 5-stamp mill. Plans for adding 20 stamps more and building a cyanide plant are being considered.

Consolidated Mining Co.—Tentative plans for a mill have been drawn up for this company's Hostotipaquillo property, in the State of Jalisco, Mexico.

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Rehearing of Filter Suit Denied

On Dec. 23, 1912, the Butters Filter Co. applied for a rehearing in the case of the Moore Filter Co. vs. the Tonopah-Belmont Development Co., which had been decided against the defendant company in the U. S. Circuit Court of Appeals for the Third Circuit. The motion for a rehearing was denied on Feb. 13, 1913. So far as this particular case is concerned, this undoubtedly marks the final stage, although it is possible to inaugurate a new trial in another circuit provided new and material evidence be introduced.

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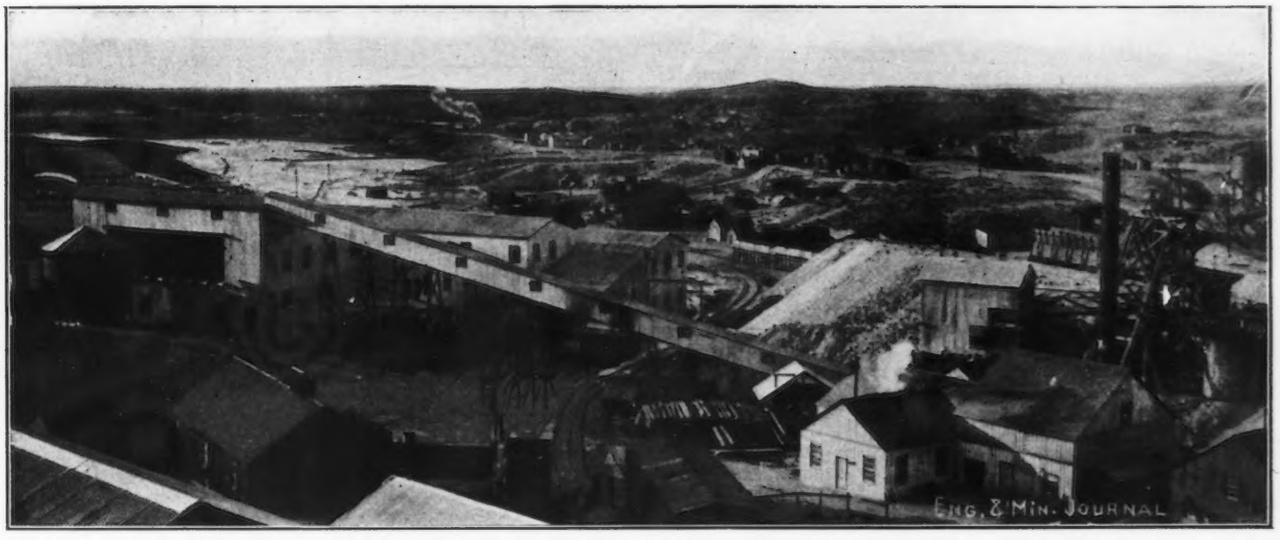
Sixty-four Hardinge Conical Mills will be used in the new No. 2 regrinding plant of the Calumet & Hecla Mining Co. in Michigan. On page 252, of the "Journal" of Jan. 25, 1913, it was inadvertently stated that 64 tube mills would be installed.

Silver Cyanidation at Tonopah—II

By Herbert A. Megraw

SYNOPSIS—The Tonopah Extension makes use of stamps for crushing in accordance with general Tonopah practice. An innovation is the use of tube mills in tandem. Trent agitator used with some modifications. Zinc shavings are believed to have some advantages over dust. MacNamara mill, one of the newest plants built, uses 1400-lb. stamps and narrow mortars for quick crushing. One tube mill used of large diameter and short length. Excelsior used for clarifying solutions before precipitating in zinc boxes on shavings. Desert mill, the first plant in the district, makes use of separate treatment system for sand and slime. Design is similar to that of the South African plants and includes tailing wheels as elevators. Recrushing performed in Huntington and chilean mills. Excavating apparatus used for sand handling. Costs are higher than those obtained with modern all-slime plants.

The mill of the Tonopah Extension Mining Co. is situated at the edge of the town of Tonopah. It is one of the later mills and embodies more recent ideas in metallurgy of the Tonopah ores. Some of these departures are of much interest, among them the use of tube mills in tandem



Headframe and Mill of the Tonopah Extension Mining Co., Tonopah, Nev.

The ore is first crushed through a No. 4 Kennedy gyratory crusher and is then taken by an inclined belt conveyor to the mill bins. From these it is fed through suspended Challenge feeders into the stamps. There are thirty 1050-lb. stamps having 7-in. drop and 100 drops per min. Four of the batteries are equipped with 12-mesh screens and two with 3-mesh screens of the "toncap" type, the object of the use of these different screens being to furnish a pulp of varied coarseness with the idea of increasing the efficiency of the tube mills. It is maintained that the coarser portion of the pulp not only provides a means of satisfactorily using a part of the grinding action of the pebbles which is expended in crushing upon themselves, but actually assists in grinding the finer portions into slime.

Tube Mills in Tandem

From the batteries the pulp is received by a duplex Dorr classifier, which removes the slime and delivers the sand and coarser rock into the first tube mill. This is a machine 5 ft. diameter and 18 ft. long, following the recent accepted design. It is equipped with spiral scoop feeder and Komata lining, and makes 27 r.p.m. In this mill there is but one passage of the pulp, there being no return of oversize to it. It performs a heavy duty in reducing the larger particles of the pulp, as the analysis shows.

From this first tube mill the pulp is received by a second Dorr classifier, the slime is taken out and joins the stream from the first, and the sand requiring regrinding is led into the second tube mill. This mill is the same size as the first one, but is equipped with a smooth cast lining, in distinction to the first which has a Komata lining. Here the fine sand is ground into the slime required for total pulp. The product issuing from the mill is returned to the second classifier, thus forming a closed circuit from which only the portion light enough to pass over the discharge of the Dorr classifier issues. The accompanying table shows the clasification of the entering and issuing pulp of each mill and also the classifier overflows.

The Trent Agitator Used

From the regrinding system the pulp is taken to four cone-bottom settling tanks, each 24x16 ft., where the collection of slime is made, the overflowing solution being either pumped back for further use or sent to the precipitation department, according to conditions. This bulk of solution is used to maintain the balance between precipitation and the total solution used in the mill.

Note—This is the tenth in a series of articles by Mr. Megraw on American cyanide practice. Previous papers appeared Nov. 2, Nov. 23, Dec. 14, Dec. 21 and Dec. 28, 1912, and Jan. 4, Feb. 8, Feb. 15 and Feb. 22, 1913.

From the settlers the slime is drawn off into the agitation tanks, of which there are four, each 24x16 ft., all equipped with Trent agitators. At the Extension mill the Trent agitators are regarded as highly efficient and satisfactory devices, although it is acknowledged that they are not without their faults. They do give some trouble, due to plugging of the nozzles, and it is also found that the bearing upon which the arms revolve is not entirely grit proof and is subject to grinding action

SCREEN ANALYSES OF TUBE MILL AND CLASSIFIER PRODUCTS AT TONOPAH EXTENSION MILL

	+10 mesh	+20 mesh	+60 mesh	+100 mesh	+150 mesh	+200 mesh	—200 mesh
Tube mill No. 1 intake (Komata lining)	15.45	16.90	40.00	14.00	4.19	4.62	4.91
Tube mill No. 2 intake (smooth lining)	1.77	1.06	18.08	35.82	14.35	13.83	15.09
Tube mill No. 1 discharge	1.00	0.80	17.20	26.60	8.60	11.20	35.60
Tube mill No. 2 discharge	....	...	2.60	20.60	14.00	16.80	46.00
Classifier No. 1 overflow	....	...	...	0.16	1.00	2.8	96.81
Classifier No. 2 overflow	....	...	...	1.89	5.91	14.60	77.60

of the pulp which gets into it. Some experiments have been made lately by removing the nozzles from the air and pulp-delivery pipes, which constitute the arms, and it has been found that while the speed of revolution has been diminished, there is no other ill-effect and the agitation continues as usual. This procedure is calculated to lessen the probability of stoppage from plugged nozzles. Another experiment to avoid the wear occasioned by grit entering the bearings and grinding them out has been made by removing the bearing altogether from the tank and suspending it above the tank, connecting it with the revolving arms by means of a pipe. It seems probable that both these variations may be productive of economies, and a final decision on the matter will be of interest.

The power required to move the Trent agitators is stated to be 6 hp. for each agitator, plus the power required for furnishing compressed air, which in this case is 13 hp. for five agitators, including the four treatment agitators and the stock tank.

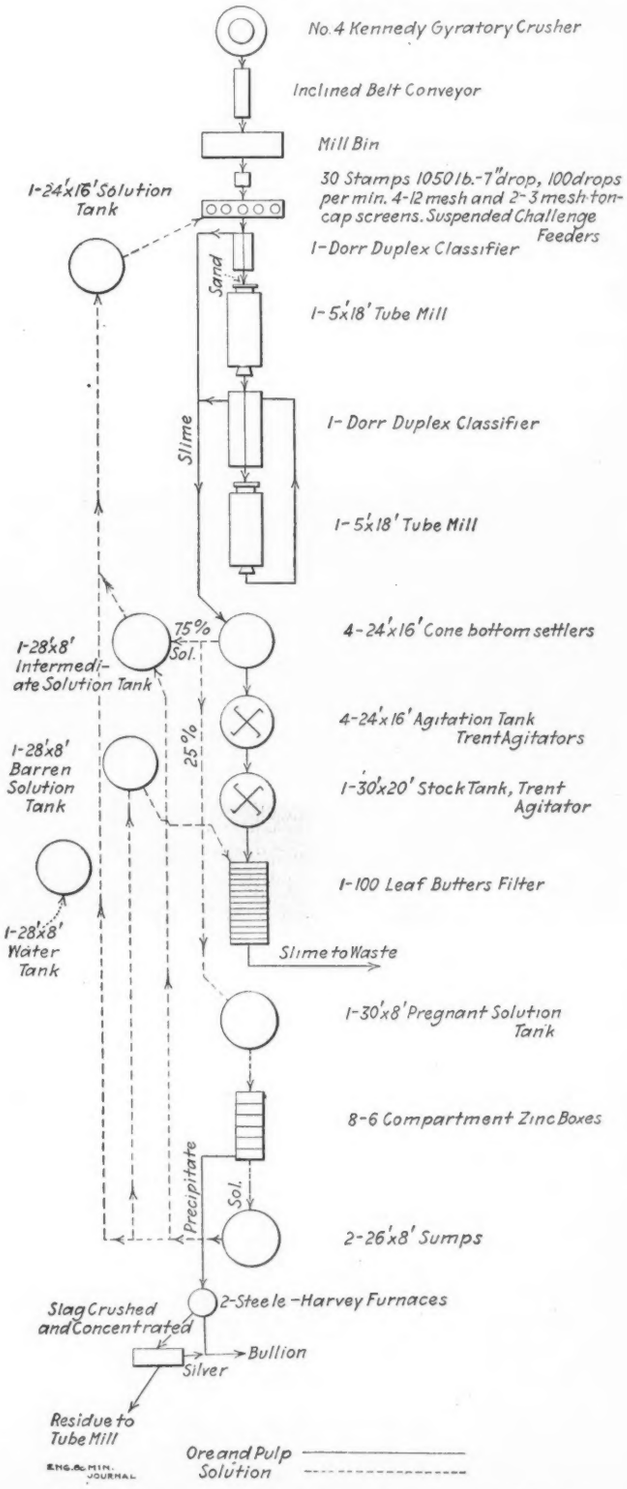
Stationary Vacuum Filter Used

From the agitators the pulp is taken to a stock tank, 30x20 ft., which serves to feed the filter. The stock tank is equipped with a Trent agitator to keep its contents in suspension. From the stock tank the pulp is taken to a stationary vacuum filter of the Butters type having 100 leaves. The filter is operated in the usual way, a cake of 1½ in. is made and given a 2-hr. solution wash. The usual cycle is six hours in total. An additional extraction is made on the filter, which at times reaches 3%. The slime at the Extension mill is easy to filter as is generally the case with the Tonopah ores.

Zinc shavings are used for precipitation. The solution is clarified by passing it through excelsior and is precipitated in eight 6-compartment zinc boxes, each compartment being 30x36x30 inches.

The precipitate resulting is partially dried and fluxed and melted in Steele-Harvey furnaces. The slag is allowed to accumulate until sufficient is at hand for treatment when it is crushed in one of the batteries, concentrated to remove the metallic particles and the remainder added a little at a time to the tube mill, where it is crushed to a slime and cyanided along with the regular mill run of ore. By treating the slag in this manner only a small portion is added to the mill run every day, and it is soon used up without any detrimental effect. It avoids the expense of shipping the material to smelters and it is probable that the ultimate economy of the scheme is as good or better than when it is shipped.

There is some controversy over the relative merits of zinc shavings and zinc dust as a precipitant in the Tonopah district, and the operators at the Extension mill believe that the process using shavings is as satisfactory and economical as when the dust is used. They point to the fact that their consumption of zinc is as low as is usual when zinc dust is used and that their cost of



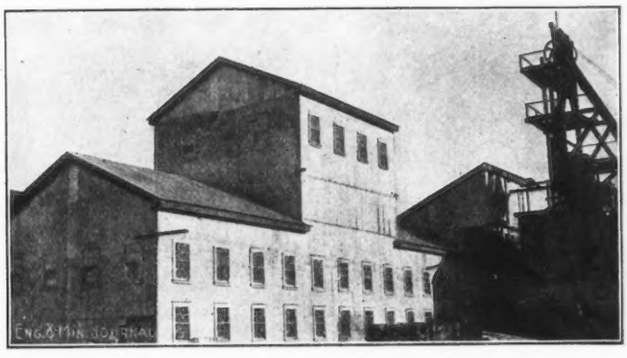
Flow Sheet of Tonopah Extension Mill, Tonopah, Nev.

cleanup is no more than in such cases and also that their resulting bullion is better and barren solutions are easily secured. This question is one which will stand a good deal of argument, and there seems to be something of advantage for each system. It is, however, difficult to overlook the great advantage in simplicity and safety obtained by the use of zinc dust. This matter will be referred to again in considering the metallurgy of Tonopah in a general way.

High Extraction Obtained

The extraction obtained at the Extension is consistently high and may be said to be about the limit obtainable on Tonopah ores. The material treated contains silver and gold in the proportion of about 90:1, the heads averaging 16 oz. silver.

The pulp is given 40-hr. agitation in the tanks with solution of about three pounds of KCN per ton. The extraction obtained averages about 94 to 95% of the total content. As an example of the division of extraction a typical month showed 25.77% in milling, 67.57% in agitation and 1.74% in the stock tank and in filtering. Solutions are warmed at this mill, as is the general practice at all Tonopah mills, to 120°, and it is claimed that a



MacNamara Mill, One of the Newest Plants at Tonopah, Nev.

clear and definite additional extraction is obtained over working with normal temperatures.

The consumption of material is as follows: Cyanide, 2.78 lb.; lead acetate, 0.963 lb.; lime, 3.398 lb., and pebbles, 4.423 lb., all calculated per ton of ore milled. The consumption of zinc is 0.052 lb. per oz. of bullion recovered. The mill treats about 155 tons of ore per day with 400 hp., and employs 14 men regularly, including the superintendent. The accompanying flow sheet shows the details of the system followed.

MacNamara Uses Heavy Stamps

The mill of the MacNamara Mining Co. is one of the most recent of the Tonopah installations, and originally contained a number of innovations, most of which, however, have made room for devices conforming to standard practice.

The ore is brought into the mill over a conveying and sorting belt, and that part of the waste which is easily recognizable is thrown out. A Kennedy gyratory crusher is used for primary crushing and the ore is then dropped into the battery bins.

There are 10 stamps in the mill, fed by suspended Challenge feeders, the stamps weighing 1400 lb. each. They are set in a special heavy-duty mortar, the screen being only three inches from the dies. This type of mortar is designed for rapid crushing and, in fact, at the MacNamara mill a duty of 7.5 tons per stamp per day is attained. With stamps of this weight this could not be considered an exceptionally high duty, but the crushing capacity is limited by the following regrinding installation which will not permit any greater output. The stamps make 98 drops per minute through 8 in., and the mortars are equipped, one with 8-mesh and the other with 12-mesh screens. The different screens are used with the idea of furnishing a varied feed for the tube mill, as has been mentioned in the case of the Tonopah Extension mill, although the efficiency of this procedure in the case of the MacNamara would seem to be limited by the use of a single tube mill.

The tube mill used is 5 ft. diameter and 16 ft. long, which is carrying the shortness to the extreme. As has been mentioned, the tendency at the present time is to limit the length of the tube mill, and this instances the progression of that tendency. It is stated that with the 16-ft. mill the results are the same, as far as fineness of output is concerned, as if the 22-ft. length were used and the wear on the lining and the power and pebble consumption are less. This mill is equipped with smooth cast lining and runs at 26 r.p.m. and uses about 60 hp. for its operation. The cast lining is stated to wear 11 months, and as it is locally cast, hard iron, the renewal cost is not high. The mill is equipped with a scoop feeder of the spiral type. The discharge is taken up by an 8x52-in. Frenier pump and returned to the classifier, making a closed circuit.

Another Use of the Trent Agitator

The slime from the classifier is collected and thickened in a Dorr thickener, 26x12 ft., the overflow solution being returned for battery use and the thickened slime proceeding to the agitators. There are two agitator tanks, each 26x16 ft., equipped with Trent agitators actuated by 4-in. centrifugal pumps of the local make already mentioned. Originally the arrangement of these agitators was somewhat different, the bearing was situated outside and below the bottom of the tank and connected with the revolving arms by means of a pipe which also revolved. This pipe passed through a stuffing box in the bottom of the tank, but it was found that when the gland was tightened sufficiently to prevent leakage, the free revolution was prevented and the agitator was likely to stop at any time. Recourse was had to the standard Trent device and subsequent trouble has been confined to the points previously mentioned.

Agitation in these tanks is continued for a total of 55 hr., which includes the time required for filling the tank. The filling time is 18 to 20 hr., during which the agitators are in use and the pulp receives efficient agitation. A 2-lb. KCN solution is used for treatment.

After the completion of agitation the pulp from the agitators is received in a stock tank, 27.5x19.5 ft., also equipped with a Trent agitator. From this tank the pulp is drawn off to a 50-leaf vacuum filter of the Butters type. In the construction of the tank for this filter it was intended to discharge it from a single point, and the bottom was not divided into separate hoppers, but consisted of a single V-bottom, in which was placed a spiral screw conveyor to convey the discharged slime to the point

of exit. This arrangement was found to be decidedly unsatisfactory, as the slime stuck and piled up on the side of the tank and eventually the screw was tunneling under the mass of slime. In order to remedy this defect the bottom was divided up into separate hoppers by inclined partitions, and is now conforming to usual construction.

The filter cycle occupied a total of 4½ hr., which includes a 2-hr. solution wash and 5- to 10-min. water wash as final treatment. The cake is formed in from 60 to 80 min., and usually has a thickness of about 1¼ in. In common with most Tonopah slimes, this cake is easily washed.

Zinc Shavings for Precipitation

In accordance with the usual Tonopah practice, zinc shavings are used for precipitation, there being four 6-compartment boxes preceded by a special box containing excelsior for clarifying the solutions. It is to be noted that several plants in Tonopah are using this excelsior clarifying system and it seems to do the work in a satisfactory manner. It is undoubtedly a simple and cheap process and for small plants seems to be a cheaper method than installing clarifying presses. A box is made on the principle of the zinc precipitator box, the size varying with the requirements, and is filled with excelsior through which the solution passes in the same manner as through a zinc zox. The excelsior is packed rather tightly and effectually prevents suspended slime from entering into the zinc box. The excelsior is easily and cheaply cleaned when there is sufficient accumulated slime to make cleaning necessary.

The precipitate is partially dried, fluxed and melted in a Steele-Harvey furnace, the slag crushed and screened to separate the metallics which are returned to the bullion melts. A flow sheet of the mill is given, showing in detail the metallurgical procedure.

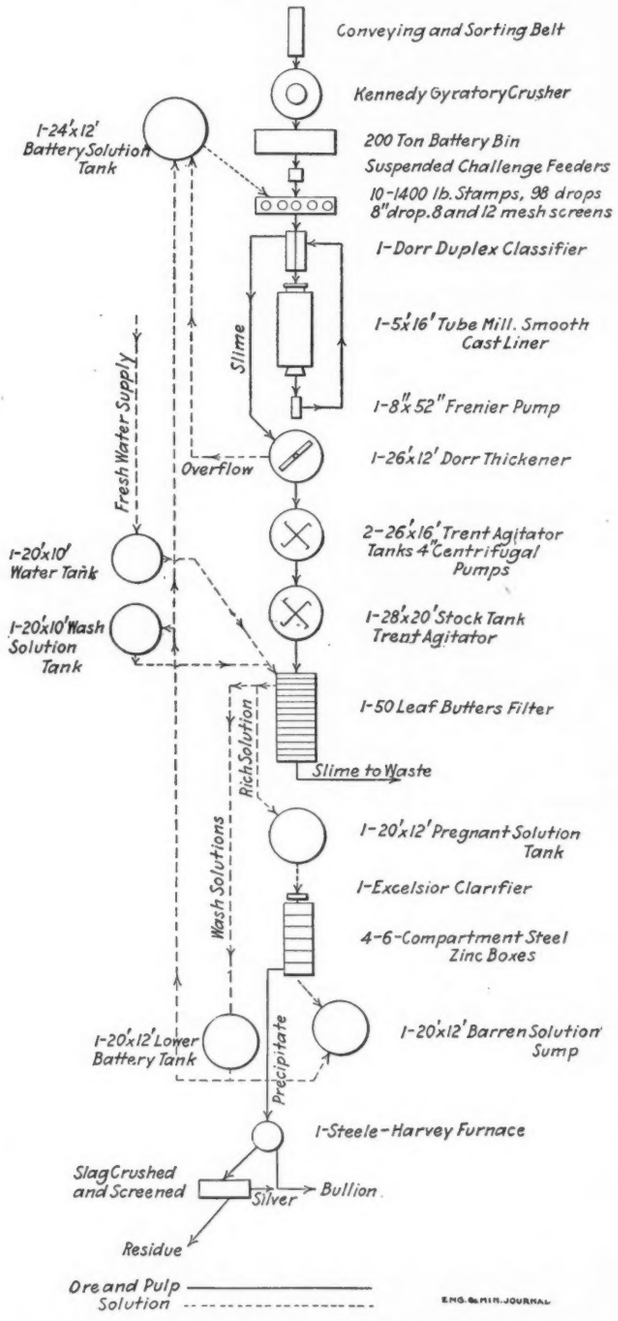
The extraction secured is 90 to 92%, in conformity with that secured by most of the other tube mills of the district. The consumption of cyanide is about 1½ to 1¾ lb., and of lime about three pounds. The lime is added to the classifier in dry form. Of lead acetate the consumption is 0.55 lb. per ton milled, and of pebbles, four pounds per ton milled. The mill crew consists of seven men, not including the superintendent.

The MacNamara is the smallest mill in the district and its operating costs are not to be fairly compared to those obtained by the larger mills. It is stated, however, that the costs are not materially more than those of the mills which most nearly approximate its capacity. The mill is situated in the town of Tonopah, and is convenient to sources of supplies and finds it easy to secure labor sufficient for its needs. The details of the treatment are shown in the accompanying flow sheet.

Separate Sand and Slime Treatment at the Desert Mill

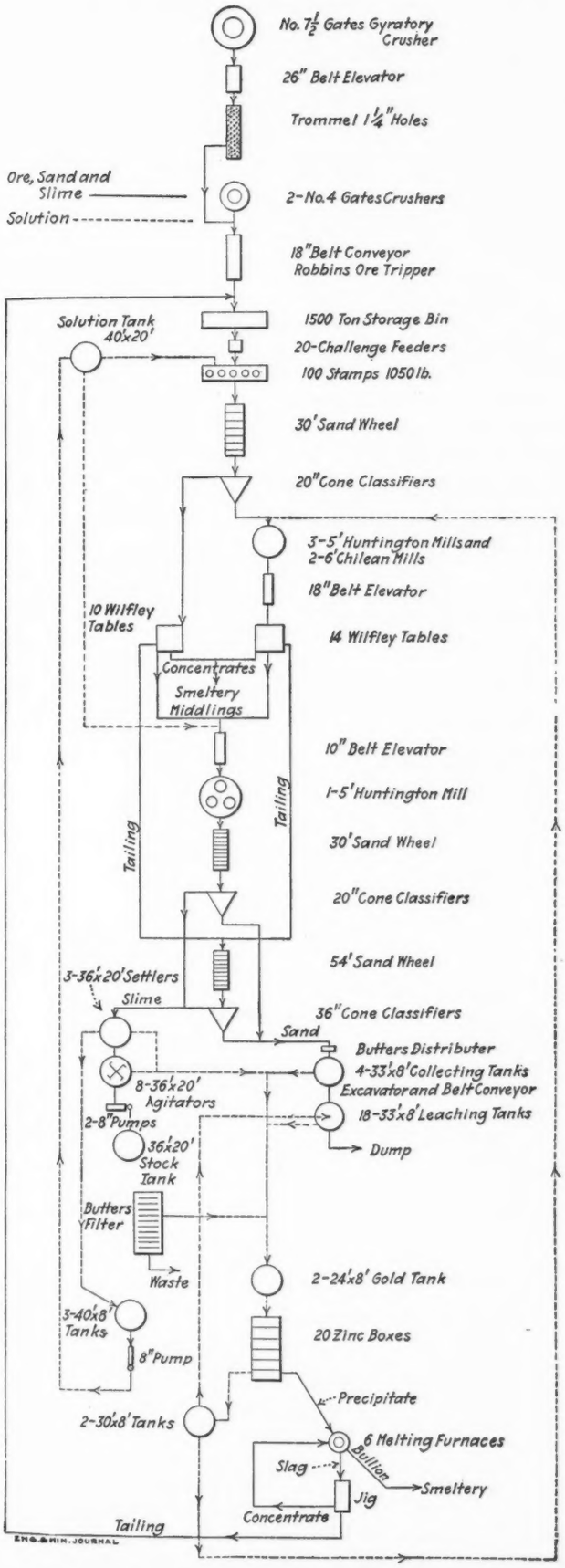
Besides the mills in Tonopah proper, there are two that are, or have been, milling Tonopah ores with success. The most important of these is the mill of the Desert Power & Mill Co., at Millers, 13 miles from Tonopah. This has been reducing ores of the Tonopah Mining Co. for some years, it being the original cyanide mill of the Tonopah district, constructed in 1906. The mill contains 100 stamps of 1050 lb. each and regrinding is performed in Huntington and chilean mills of the Monadnock type. The ore is crushed in solution, as is the practice in all mills of the Tonopah district, and is concentrated on Wilfley tables in order to recover the sulphides which are not so easily cyanided.

The sand and slime at this mill are treated separately after the older method in use before treatment as total



Flow Sheet of MacNamara Mill, Tonopah, Nev.

slime became universal. In this plant the slime is treated in tanks having mechanical agitation by means of revolving arms moved by gears at the top of the tanks. The sand is subjected to double treatment, being collected in 33x8-ft. leaching tanks and afterward removed by means of Blaisdel excavators and distributed with distributors of the same make into secondary leaching tanks of the same type and size.



FLOW SHEET OF DESERT MILL, MILLERS, NEV.

It is noteworthy that although crushing is in solution and concentration is practiced in the same solution, the amount of metal dissolved during these operations is proportionally small, and it is found necessary to take advantage of every possible means of increasing the dissolution of the metal after that point.

The plant in general is much like the South African plants of an early period, containing tailing-wheel elevators, separate treatment with its consequent large area of tanks for leaching and slime treatment, and comparatively great area under the mill roof. The mill is extremely interesting as a comparison with modern mills of the same or greater capacity now operating in Tonopah and a flow sheet of it is herewith presented. The mill treats 500 tons per day, of which 60% is treated as slime and the remainder as sand, the sand requiring about 15 days' leaching to extract the maximum economical percentage. It requires 770 hp. and 64 men for its operation.

Detailed descriptions of the Desert mill have been published in the technical press, and it is not necessary to review its methods in detail at this time, as they are sufficiently well known. It would, of course, be impossible for a mill of this kind to beneficiate ores at a cost comparable to that attained in modern mills, but it may be said that for a mill of its type, the Desert plant is still performing good work. A comparison of the Desert mill with the new Belmont plant forms a good object lesson as to what great changes have taken place in the cyanidation of silver ores within six years.

At Millers there is also the old mill of the Belmont company, having 60 stamps and built after the separate treatment plan, much like the Desert mill. This mill is now treating a small quantity of custom ore and retreating some of its sand tailing. A description of it would be unnecessary at this time.

(To be concluded)

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The Volatility of Metals

Some recent experiments of Sir William Crookes, related in the *Transactions* of the Royal Society, are republished in *Metaux et Alliages,* January, 1913. At a temperature of 1300° C., Crookes has found that after 30 hr. of heating, platinum had lost 0.24% of its weight; iridium, after 22 hr., 7.6%; vanadium, after 30 hr., 0.74%, and rhodium, 0.1%; ruthenium, after eight hours only, had lost 25% of its weight. The large losses shown for iridum and ruthenium point probably to the formation of an oxide volatile at 1300°. The appearance of platinum is not extensively modified by this heating. Palladium, on the other hand, loses its ductility and becomes crystalline with a grayish reflection. The same modification, but even more accentuated, is shown with iridium.

In working at 900°, after 22 hr. of heating, neither platinum nor rhodium diminish perceptibly in weight, while the losses of the other metals are excessively small. The observation which led to Crookes making these experiments, was that in a porcelain tube heated by a platinum helix wound about it, the platinum wire at length broke and at the point of rupture there was found a deposit of hexagonal microscopic crystals of platinum, which led him to the belief that platinum and its alloys volatilize at temperatures well below their point of fusion.

The Constitution of Copper Slags

SYNOPSIS—An investigation of copper slags from the standpoint of the mineralogist, i.e., viewing all slags as mixtures of two minerals. Microscopic examination sometimes disagrees greatly with chemical analysis, owing to the existence of iron as magnetite.

The work of J. H. L. Vogt, who views slag from the standpoint of physical mixtures (solutions in which the entities are minerals) has opened up a new field in the study of slag, and the following paper is an attempt to apply this method to metallurgical slags.

All Molten Slags Are Solutions of Two Minerals

Copper slags, broadly considered, may be said to have the following composition: Silica from 30 to 50%; lime, including magnesia, from about 2 to 35; ferrous oxide from about 12 to 65; and alumina up to 12%. Magnesia and zinc oxide may be present in considerable amounts, but if so, the subject requires separate discussion and is again referred to. When present in small amounts, both magnesia and zinc oxide may be considered to replace iron oxide in some of the mineral forms. With the above range in composition the silicate degree of the slag varies between an ortho-silicate and the meta-silicate, and for practically all slags lies somewhere between the two. That is, the slags when molten will consist largely of solutions of two minerals, one an ortho-silicate and the other a meta-silicate.

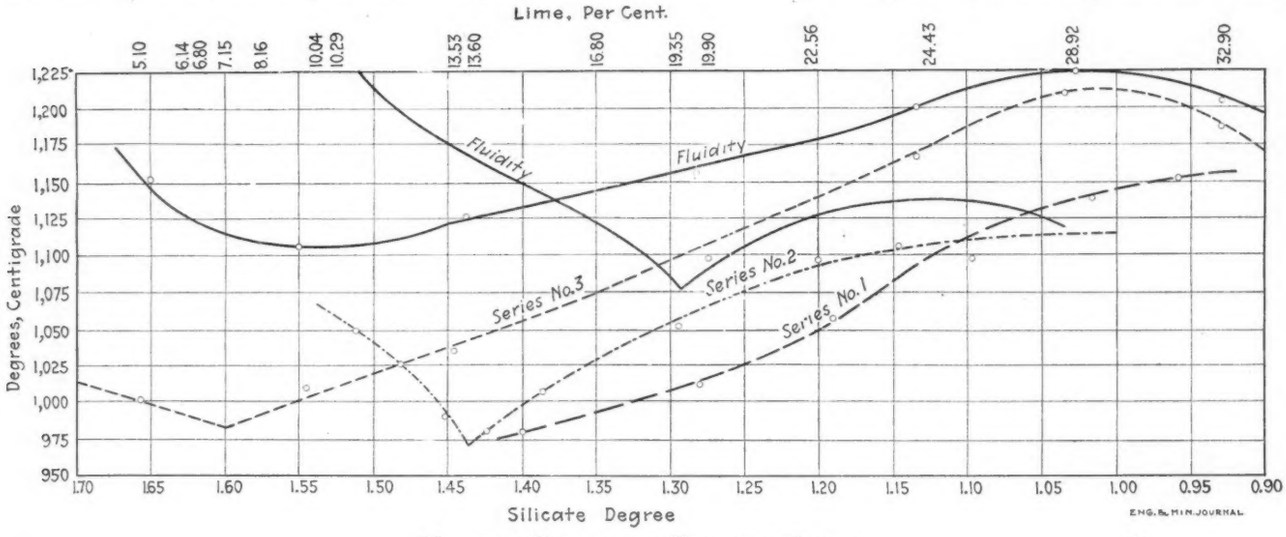
What these minerals are depends upon the base composition of the slag and largely upon the relation of lime to iron oxide to alumina. In this manner series are formed in which two minerals are respectively the end members and all compositions between are various mixtures of the two minerals. The addition of one mineral to the other will cause a change in the freezing point according to well known laws and for the range in composition from one mineral to the other there is established a freezing point or a melting point which is rational and will fall into one of two well known types.

The mineral series possible for copper and lead slags according to silicate degree and base composition is given in the accompanying table:

MINERAL SERIES OF COPPER AND LEAD SLAGS

Silicate degree	Mineral series	Base composition within limits specified
Ortho-silicate	Olivine—magnetite (fayalite)	Very high in iron
Ortho-silicate	Olivine—melilite	High lime, low iron, high alumina
Between ortho- and meta-silicate	Melilite—augite	Same as above
	Augite—olivine (iron-lime olivine)	Less lime, more iron, high alumina
	Augite—olivine (fayalite)	High iron, less lime, lower alumina
	Rhombic pyroxene-olivine (hypersthene)—(fayalite)	Little lime, high iron, low alumina
Meta-silicate	Rhombic pyroxene-augite	Low lime, comparatively high iron, some alumina

The slags ordinarily made in copper smelting will fall chiefly into the third, fourth, fifth and sixth classes of column two, depending on base composition. Alumina in the presence of considerable lime will go to augite or melilite. If the composition of the slag mixture is such that neither of these minerals can form, alumina is apt to form spinel, which crystallizes from molten slag at a high temperature causing furnace difficulties. The formation of the spinel is greatly aided by the presence of magnesia or zinc or both, even in small quantities.



Melting Point and Fluidity Curves

High Alumina and Zinc, Incompatible in Slag; Also High Alumina and Magnesia

Ordinarily magnesia passes to the olivine or hypersthene mineral; zinc to the olivine mineral, particularly to the high-iron olivine or fayalite. It is thus apparent that if a slag is to carry considerable alumina it must also contain considerable lime in order to form augite or melilite and if it is to carry considerable zinc, much iron and but little lime must be present to give opportunity to form fayalite. High alumina and zinc are incompatible and high alumina and magnesia are incompatible.

The entire field of copper slags may be roughly divided into the following series: Silica varying between ortho- and meta-silicate, CaO: FeO: : 70: 30 and 60: 40, melilite—augite; silica varying between ortho- and meta-silicate, CaO: Fe: : 50: 50 and 40: 60, olivine—augite;

Note—Abstract of a paper entitled "Constitution and Melting Points of a Series of Copper Slags," by Charles H. Fulton. Bull. A. I. M. E., December, 1912.

silica varying between ortho- and meta-silicate CaO : FeO : : 30 : 70 and 5 : 95 olivine—augite, and olivine—hypersthene.

If the melting point of a number of slags in these six series be determined the field of copper slags will be practically covered, for any additional curves of interest can then be plotted from the data obtained, by taking the slag of the same silica contents from the six series and showing the effect of varying ferrous oxide and lime with constant silica. The effect of varying alumina will have to be separately determined.

In the work described below one olivine-augite series and two melilite-augite series were investigated, in each series the iron-alumina ratio remained constant while the line varied with the silicate degree. The reason for this is that the ordinary reverberatory slags fall into such a series and the problem presented is a practical one, that is, with a certain ore mixture essentially constant in composition with regard to silica, iron and alumina, what is the effect on the melting point of the slag of the addition of constantly increasing quantities of lime (the flux)? Also how low may the lime be and how high can the silicate degree be carried and still have practical slags?

In the accompanying table is given the composition of certain reverberatory slags as actually produced, showing the mineral character (the methods of analysis used were exact and not rapid technical methods).

COMPOSITION OF REVERBERATORY FURNACE SLAG

SiO_2	FeO	Al_2O_3	CaO	MgO	Cu	KNaO	Petrographic Notes
38.50	37.98	7.62	12.62	1.01	0.21	2.14	Ground mass a glass. Large number of feather-like crystals of a pyroxene, probably hedenbergite. Some colorless rod-like crystals, perhaps olivine? Considerable magnetite.
42.74	32.33	7.76	13.32	0.94	...	..	Mostly an aggregate of green fernlike crystals of a pyroxene (augite) constituting about 75% of the slide. Considerable magnetite.
40.12	36.40	7.21	13.22	0.98	...	..	Same as above
37.24	42.92	6.38	10.32	0.96	...	..	Mostly an aggregate of light green radiating interpenetrating crystals, probably, hedenbergite and a darker brown augite, much magnetite.
49.96	26.69	8.90	12.12	1.30	...	..	Consists largely of augite, well crystallized, the balance being magnetite and a little glass.

It is apparent from the results that the most prominent constituent of the regular slag is a pyroxene, in some instances hedenbergite, in most cases augite, in one slag both are present. Olivine is also probably present, magnetite is a common constituent. These slags belong to the binary series, augite-olivine, in which according to J. H. L. Vogt, a eutectic is present, or they may be considered to belong to a ternary series, augite-olivine-magnetite. In the first-named series the eutectic composition, or the mixture of the two minerals that has the lowest melting point, occurs when the silicate degree of the mixture is about 1.65. In a silicate, owing to viscosity, the eutectic usually congeals to a glass (the residual glass of the above description) and one member of the series. In this instance the olivine may be largely in the glass and undistinguishable as a distinct mineral.

Microscopic Examination Gives Results Unsuspected from Analysis Only

The presence of an abundance of augite and practically no olivine shows these slags to belong on the augite side of the eutectic and to be of a silicate degree greater than 1.65. This is not apparent from the chemical analysis, for calculations made in the ordinary manner, assuming all the iron present as ferrous oxide gives a silicate degree considerably lower, that is, the silicate degree of the fourth slag is 1.22 which calls for olivine crystallization first. This apparent discrepancy is readily explained when the presence of magnetite is considered, for if 25% of the iron present in this slag be in the form of magnetite the silicate ratio becomes 1.45. A considerable portion of the iron shown by the analysis is in the form of magnetite.

Converter Slag May Not Be a Good Flux

This has the effect of increasing the silicate degree of the slag decidedly above that called for by analysis. The source of the magnetite in the slag is not certain. It probably comes from the converter slag which is added in the furnaces, but part of it may be from the calcines making up the charge, or it may be formed during smelting. The iron in the magnetite cannot be considered as flux for silica and if present is detrimental insofar as it crystallizes out of the slag at comparatively high temperatures, passing in part to the underlying matte and when present in sufficient quantity making a mushy slag which may entangle considerable matte and thus cause high-copper slag. The value of converter slag as a flux seems questionable in many instances on account of the presence of this magnetite. It is customary to consider the iron in slag to be present in the ferrous condition entirely and combined with silica. That this is not true is shown by microscopic analysis. It has been noted frequently by different observers that many slags containing considerable iron are magnetic. It is also worthy of note that slags containing augite are likely to contain ferric as well as ferrous iron, since both forms of the oxide enter into the constitution of the augite molecules. That this is the case with the reverberatory slags under discussion is indicated by the brownish color of some of the augite found. The amount of magnetite in slags is sometimes appreciably more than 10% of the weight of the slag, thus removing a large portion of the iron from the influence of the silica.

Melting Point of Slags

In the discussion of certain thermal properties of slag, such terms as formation temperature, melting point, freezing point, viscosity, superheating and fluidity are frequently used, sometimes in a confusing manner, so that it seems desirable to view some of these properties in the light of physical investigation.

From the metallurgical standpoint the most important physical property of the slag is the temperature at which it will readily flow from the furnace and permit the separation of metal and matte from it by gravity. This property of fluidity is closely related to the melting point and to the viscosity (resistance to flow) in a certain temperature range above the melting point. The melting point, defined as that temperature at which the solid slag passes to the liquid condition, is perhaps the property best suited for the purposes of investigation, as will be evidenced below.

The melting point of a silicate is not a sharply defined temperature, however, as the melting of the mass takes an appreciable time and the time-temperature curve during the melting state is therefore an oblique one and

not a short, nearly horizontal jag such as that in the freezing curve or melting curve of metal. This time lag in the melting or freezing process is most pronounced the more viscous the substance is, at or near the melting point, and is prominent in such substances as orthoclase and albite, or other silicates containing considerable alumina, and in some borates, but is not very pronounced in the iron, lime or manganese silicates. Many silicates also possess the property of appreciably undercooling below the true freezing point before solidification or crystallization sets in and the latent heat of fusion is given out. Therefore, in taking a freezing point, it almost invariably comes too low, sometimes by 100° C. or more.

While undercooling is a prominent phenomenon in silicates, overheating, that is the possibility of heating beyond the temperature of the true melting point without liquefaction, is also possible for many silicates, but it seems to be negligible for many silicates, especially those of the types under consideration.

COMPOSITION OF BASAL SLAGS

No. of Series	SiO_2	FeO	Al_2O_3	CaO	Ratio, SiO_2:FeO:Al_2O_3
1	42.65	36.12	11.30	6.20	377:319:100
2	44.50	38.20	11.85	5.10	376:323:100
3	44.30	43.10	4.85	6.80	914:888:100

COMPOSITION AND MELTING POINT OF THE SLAGS

Series No.	SiO_2	FeO	CaO	Al_2O_3	Total	Silicate degree	Melting Point(°C.)
1	42.65	36.12	6.20	11.30	96.37	1.40	979
1	40.66	34.33	10.80	10.70	96.49	1.28	1011
1	38.80	32.60	14.95	10.02	96.37	1.19	1060
1	36.90	31.10	18.52	9.75	96.27	1.09	1081
1	35.40	29.65	22.12	9.35	96.52	1.02	1137
1	33.92	28.48	25.14	9.00	96.54	0.96	1151
2	44.50	38.20	5.10	11.85	99.65	1.51	1050
2	44.00	37.80	6.14	11.73	99.67	1.48	1025
2	43.50	37.30	7.15	11.60	99.55	1.45	988
2	43.20	37.00	8.16	11.51	99.87	1.42	982
2	42.25	36.20	10.04	11.23	99.72	1.38	1010
2	40.50	34.65	13.60	10.75	99.50	1.28	1064
2	38.90	33.25	16.80	10.40	99.35	1.20	1091
2	37.55	32.10	19.90	10.05	99.60	1.13	1103
2	36.20	30.81	22.56	9.67	99.30	1.06	1107
3	44.30	43.10	6.80	4.85	99.05	1.66	1000
3	42.65	41.51	10.29	4.69	99.14	1.54	1010
3	41.11	40.01	13.53	4.51	99.16	1.44	1034
3	38.34	37.22	19.35	4.21	99.12	1.27	1097
3	35.92	34.97	24.43	3.94	99.26	1.13	1167
3	33.79	32.89	28.92	3.71	99.31	1.03	1207
3	31.90	31.05	32.90	3.50	99.35	0.934	1186

Slag Formation Temperatures Vague

The formation temperature of a slag is usually taken to mean the temperature at which the mixture of constituents that go to form the slag becomes fluid. When closely considered, this is a vague conception, for this temperature depends on a number of factors, that is, rapidity of heating, the possible formation of a eutectic, and size of particles of the mixture. It is also possible that in the mechanical mixture, one substance may go partly in the solution of the other, below the melting point of the mass as a whole. The formation point considered as the temperature at which chemical combination takes place may lie below the melting point as has been shown by Day and Shepherd for calcium silicates.[1]

From the metallurgical standpoint and with coarse material, the formation temperature so called, lies above the melting point, but it lacks definiteness for the purpose of investigation. The upper melting point of the formed slag, that is, not the melting point of the eutectic, if such be present, but that at which the whole mass passes to the fluid state, is a definite and fixed point, in those silicates in which overheating is not a phenomenon, and was adopted as the basis of this investigation.

[1]"Am. Journ. of Science," October, 1906, p. 268.

The viscosity of slag increases with silica and alumina contents and varies much for the different slags. For this reason it is necessary, aside from the melting point, to determine what temperature is required to cause the slag to be sufficiently liquid to flow, that is, what amount of superheating is required above the melting point. This degree of fluidity was determined by stirring with a heavy platinum rod and noting the temperature reading at the time of stirring. Three series of slags were prepared for this investigation.

Lime the Smelters' Variable

In many smelting problems the iron, silica and alumina bear practically a constant ratio to each other in the smelting mixture and the only variable is lime added as a limestone flux. The basal slags were made up from the ores, and the flux of the regular smelting mixture and various additions of lime made to test the effect of varying the flux.

There seems but little doubt that the slags of series 3 are augite-olivine, while series 1 and 2 are perhaps the same but more probably augite-melilite, considering the amount of alumina present. The silicate degree of the eutectic of series 3 falls at about 1.62 which is close to what J. H. L. Vogt states it to be for a certain augite-olivine series. The silicate degree of the eutectic of series 2 falls at about 1.44, which corresponds to what it should be approximately for an augite-melilite series. It will be noted that the total of the constituents of the slags in series 1 adds up to but 96½%. It is probable that some magnetite is present, which would increase the silicate degree above that calculated. This would have the effect of displacing the melting-point curve shown in the accompanying illustration to the left and that this should be done is perhaps apparent when it is noted that no maximum is reached in this curve at a silicate degree of 1, as is done in series 2 and 3. A maximum is expected at this point in a series of this type, for here occurs one of the end members of the series, that is, either olivine (lime-iron olivine or melilite). The other maximum occurs at a silicate degree of 2 or the augite end.

It is probable that in series 1, the first one to be worked out, the eutectic was missed, and was situated between slags 1 and 2. From an inspection of the curve of the composition of the slags given in the preceding table, it is apparent that the slags at lowest melting point lie roughly between a silicate degree of 1.4 and 1.65, dependent upon the base composition. This confirms what has long been the opinion of copper metallurgists. With a given silicate degree within the range of 1.70 to 1, the replacement of iron and lime by alumina, up to 11%, lowers the melting point, as is apparent when the curves of series 1 and 2 are compared with the curves of series 3.

In a given slag of certain silicate degree within the rate specified, the replacement of iron by lime raises the melting point somewhat. This, however, does not mean that a pure ferrous bisilicate, for instance, has a lower melting point than one in which some iron is displaced by lime, for this condition would be expressed by the series hypersthene-augite, in which a eutectic may also occur. It has reference to series of minerals in each of which lime is necessarily present, as augite-melilite. Then of two slags each of the same silicate degree, the

one with relatively more lime has the higher melting point.

High Silicate Slags Have Low Melting Points, but Require Much Superheat

The slags investigated have melting points which lie between 970° and 1220° C. The slags of higher silicate degree have comparatively low melting points and that portion of the curves to the left of the eutectics at the augite end rises very gradually. For example, the last slag in the first table, augite with some magnetite, practically a bisilicate, has a melting point of only 1037° C. It is, however, probable that the presence of magnetite lowers the melting point of this slag somewhat. When, however, the fluidity curves are examined in connection with the melting-point curves, it will be noted that the gap between the two curves widens rapidly as the silicate degree increases and while from 25 to 40° of superheat is sufficient in the vicinity of the ortho-silicate, from 150 to 175° is required to superheat to fluidity at a silicate degree of 1½. The fluidity curves given correspond to slag 2 and 3 only, the longer curve corresponding to series 3, the shorter to series 2. The lime percentage figures over the table refer to series 3 only. It may be seen also that increased alumina accentuates the gap greatly and the more highly aluminous slag, due to the greater viscosity, requires more superheating above the melting point in order to obtain enough fluidity. It is this phenomena which makes high-silica high-alumina slag so difficult to work. As already noted, the mineral orthoclase and albite high in alumina and silica are extremely viscous.

Slags approaching near the bi-silicate are looked upon with suspicion for reverberatory-furnace work particularly. Of late, however, the incentive to make the more highly siliceous slags has been great. On the point of formation temperature and melting point nothing can be urged against the slags, but they do require much superheating, especially if alumina rises above 5 or 6%. There seems to be no good reason why they could not be made in furnaces of ample temperature reserve such as the present oil-fired furnaces.

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Traveling Expenses in Latin America

The subject of a proper allowance for a commercial traveler in South America is discussed in *Daily Consular and Trade Reports*, Feb. 1, 1913, and the conclusions should be of interest to the mining engineer. A man of wide experience, and not extravagant, stated that on a three months' trip from New York to Ecuador, thence to Panama and Costa Rica, thence to Cartagena and Barranquilla, Colombia, thence to Bogota, his expense account by months was $430; $433; $435.

The cost of traveling is increasing steadily, partly due to better accommodations, and in the writer's opinion $15 per day was a minimum to be allowed for expenses. The traveling man mentioned carried no samples and the expenses given were those which would have to be met by any traveler making use of first-class accommodations, which, as a rule, are none too good. A traveler carrying samples would have to add charges for excess baggage and for the transfer and handling of his baggage. In country where it becomes necessary to use saddle and pack animals, additional expenses will be encountered.

Secondary Enrichment and Polished Sections

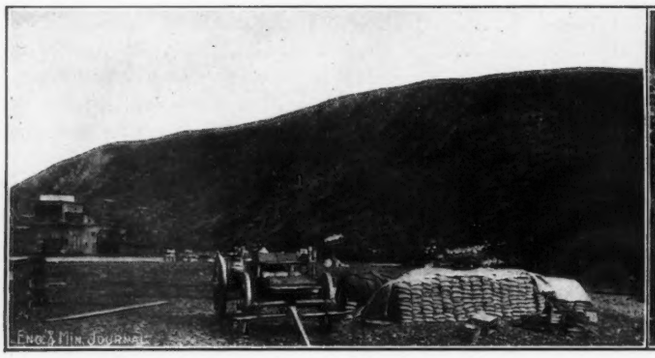
The presentation of the paper, "The Sulphide Ores of Copper. Some Results of Microscopic Study," by L. C. Graton and Joseph Murdock, at the meeting of the American Institute of Mining Engineers on Feb. 17, provoked some interesting discussion along various lines. Mr. Winchell recalled the period about 15 years ago when the possibility of secondary chalcocite was a topic vigorously discussed in Butte. He told of the establishment in 1899 of what was probably the first laboratory for the study of secondary enrichment and the great difficulty encountered in finding a reducing agent to account for the chalcocite; timber in the fire zone, tarred ropes, carbon monoxide and free hydrogen from the water, were all reducing agents present underground, capable of acting on the sulphate solutions. But all of these produced native copper and not cuprous salts, and it was a long time before the discovery was made that it was only in the process of oxidation that the proper conditions were present and the SO_2 set free in that process was responsible for the formation of secondary chalcocite. He also mentioned the occurrence in ice-cold glacial streams of Alaska, of native copper nuggets coated with secondary sulphides, a remarkable phenomenon of reduction in surroundings so highly oxidizing, and laid the explanation to the pyrite grains present, capable of starting the necessary reactions. Conditions at Butte, he said, were truly remarkable, where at 2800 ft. underground, the same conditions were found as in the upper levels, chalcocite present, enargite in process of decay and changes and transformations progressing in the veins. He stated his belief that the Butte chalcocite is partly primary and partly secondary; that the complementary mineralization attendant on the formation of that mineral was not always present, but that in many cases specular hematite was found.

Professor Moses stated in regard to mineralogical work with polished sections that he appreciated to the full the value and possibilities of the study, but objected to the indefinite methods of determining species, saying that the possible tests, so far as he knew, were very few, limited to color, etching and microchemical reactions. He urged the necessity of collecting and formulating data into tabular form.

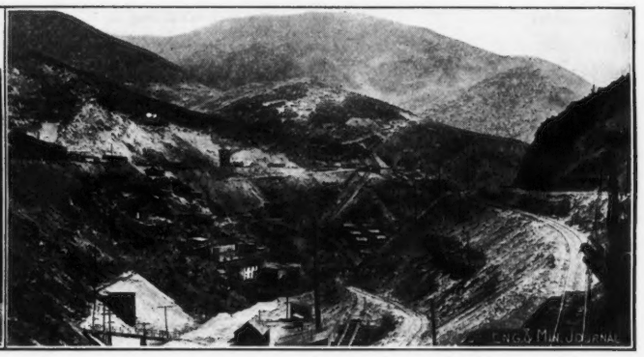
Mr. Bastin noted the similarity of conclusions reached in studying silver ores to those reached by Mr. Graton on copper ores and stated that all lines of investigation were tending to establish the theory that secondary enrichment is essentially an oxidizing process. Minerals thought to be primary were shown on microscopic examination to be secondary, and secondary silver minerals were found at great depths. Oxidation does take place in depth without the presence of entrained air in the water, and can be attributed to the water alone.

Mr. Graton, replying, asked why, if water alone was sufficient, by hydrolysis, to set up oxidation, the process should have any downward limit, and not continue to the bottom of the orebody. In regard to tests for the determination of species, he stated that it was found necessary to rely largely on microchemical reactions, and that these were only valuable when a colored precipitate was formed, but that a scheme had been worked out where, by applying four or five reagents in sequence, reasonable accuracy in determination was secured.

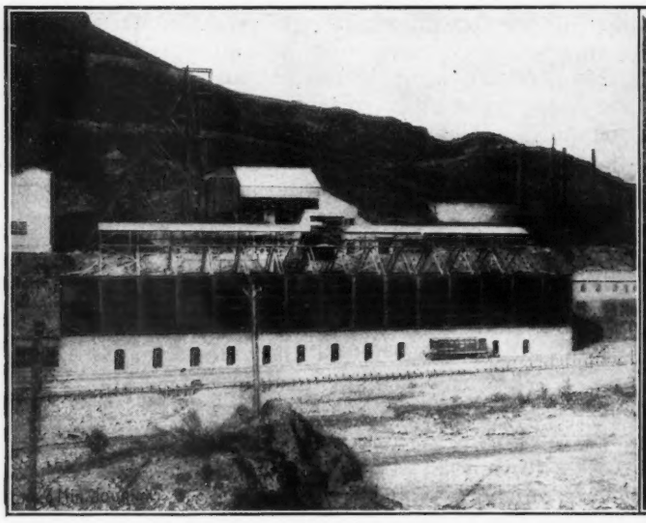
PHOTOGRAPHS FROM THE FIELD



YORK TIN DREDGE ON BUCK CREEK, ALASKA

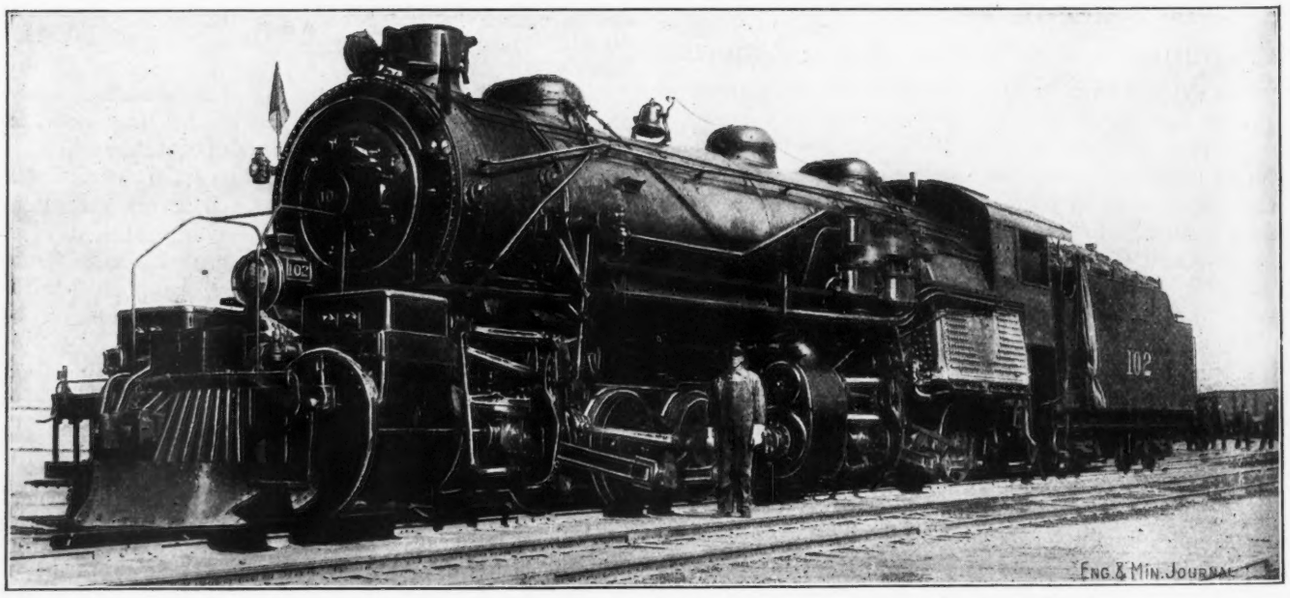


BINGHAM CAÑON, UTAH, ABOVE THE TOWN OF BINGHAM



ORE BINS OF RAY CONSOLIDATED, AT RAY, ARIZ.

BENCHES WORKED BY UTAH COPPER CO. AT BINGHAM



ONE OF THE BIG MOUNTAIN-CLIMBING LOCOMOTIVES ON BINGHAM & GARFIELD R.R.

TWO VIEWS OF BINGHAM CAÑON, UTAH, SHOWING THE JUNCTION OF CARR FORK AND BINGHAM CAÑON, AND ONE OF THE HIGH LINE TRESTLES

Madero and After

(From the New York "Sun," Feb. 24, 1913)

The assassination of Francisco I. Madero and Pino Suarez yesterday was an arch deed of massacre, a savage and summary method of doing what it had been resolved at all costs to do. It will be a horror in the eyes of all civilization. To the United States it is also the ferocious refusal of a humane request. And how can it intimidate opposition to the military oligarchy in the city of Mexico, an opposition already bitterly developed in many of the thirty states and territories?

The revolution that drove Porfirio Diaz into exile had roots deep down in the hearts of the people. It was partly political, but largely economic, the culmination of many years of sullen protest, occasionally breaking out into articulate expression and even flaring into defiance by a few hardy souls, against a system of absolutism that ground the peon into the dust and cramped the energies of representative men who were not in favor with the federal government.

The new administration was disappointing because the well meaning reformer Madero was not a practical statesman, but it represented ideals, aspirations and economic needs that will never be silenced until the reforms demanded are granted or wrung from the governing power. Mexico is full of men who are willing to die, if necessary, for the platform which was the commission of Francisco I. Madero as the leader of the revolution that deposed Diaz. These men want no return of absolutism under the guise of democratic government. They want to elect their own governors and to have a voice in the selection of judges. They want to be represented at the federal capital by a congress that will make laws for the welfare of the states and not take its orders from the president of the republic. They are in no mood to tolerate the sordid tyranny of jefes politicos. Back of these leaders are the millions of peons and farmers whose grievance is that the pledge of small holdings has been broken. The truth, of course, is that President Madero found himself powerless to keep the faith. Greatest of all the problems in Mexico is the agrarian. It dwarfs all others, and the solution of it is harassingly difficult.

The people who were known as Maderists in the spring of 1911, which saw the submission of Diaz, to outsiders an unaccountable humiliation, may be known by various names today, but their sentiments have not changed. In states not in touch with the capital they are not afraid of the military oligarchy; rather they resent its treachery to a president whom they elected themselves and who, whatever his shortcomings were, represented their desire for democratic government, and although a rich man himself had no sympathy with the Cientificos. It must not be forgotten at this time that President Madero did not interfere with popular elections in the states. Their governors have been elected by the voters, whose numbers have steadily increased under the new order, and these governors have generally been able and independent men. It was not to be supposed that all of them would accept a provisional government set up by a rough soldier upon the ruins of an honest if irresolute administration whose guiding star was the Constitution. Moreover, it may be the fact that the name Madero still has a sentimental meaning to Mexicans who do not live at the capital and thus have not been scared by butcheries in its streets.

Whatever Madero's faults or weaknesses, he represented long grievances that must be righted before permanent peace can be established in Mexico. Against relentless murderous absolutism rebellion is the only shield. May the black days of Mexico be ended speedily and a real constitutional policy established! Meanwhile the course of the government at Washington will, we may be sure, continue to be temperate, patient, just and firm.

It may be that Madero dead, and slain, after useless protests and unfulfilled promises of the gentle Huerta: it may be that this magnate, surrounded by grafters and hampered by intolerable obstacles, as he was, this dreaming impractical man may yet be far more powerful for the liberation of Mexico than he was able to be living. As for the violent, reactionary impotents who fill a constitutional state of the twentieth century with the slaughter of old Turkey or a Morocco that is already a reminiscence, they are but commending the poisoned chalice to their own lips. It is not with the name of Diaz, that doddering autocrat, whose power vanished like an exhalation; it is not with picayune heroes of a few hundred troops and many murders that in the long run the allegiance of divided Mexico can be won. Poor Madero—whose "proscription list" was written, we take it, after his deposition by his assassins—stood, however tottering, for deep, imperious, inescapable reforms that will take Mexico out of the oligarchies and make her really free and republican. Victim of another tyranny, Madero's name may yet stand with those of Hidalgo and Morelos.

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Rapid Determination of Zinc

By C. Offerhaus*

Most of our present so called rapid methods for the determination of zinc in slags and other technical products still require a comparatively long time, but I have found in Voigt's rapid method a real shortcut. It is necessary to separate almost all of the accompanying elements before the zinc titration, and in the abbreviation of this separation lies the main advantage of Voigt's method.

Present Rapid Method

The usual method for the determination of zinc, is the following: 1 to 3 grams (according to the Zn contents) of the material are treated on the waterbath with 5 c.c. concentrated HCl and 3 c.c. concentrated HNO_3, and the solution is evaporated to dryness. The residue is taken up with dilute HNO_3; 10 c.c. of a saturated solution of $KClO_3$ in concentrated HNO_3 are added and the solution is again evaporated to dryness. The residue is baked until free from Cl and HNO_3 and taken up with a solution of 5 to 10 grams of NH_4Cl in 100 c.c. water, to which 10 c.c. concentrated NH_4OH are added. The precipitated hydroxides are boiled and then filtered off. The filtrate containing the zinc is neutralized with HCl, and 5 c.c. concentrated HCl excess added, after which copper is precipitated by boiling with test lead. The solution is filtered and titrated with potassium ferrocyanide in acid solution, or by Schaffner's method with sodium sulphide in ammoniacal solution.

The main difference in Voigt's method is, that the copper is not precipitated with lead in acid solution but

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with aluminum in ammoniacal solution. This apparently small difference has the important result that it is unnecessary to destroy the HNO_3 by evaporating the solution to dryness and baking the residue (it is impossible to precipitate all the copper out of an acid solution containing HNO_3, either by lead or by aluminum). Besides copper, aluminum in ammoniacal solution also precipitates lead, which might be present in small quantities, as $Pb(OH)_2$ is not entirely insoluble in ammonia, especially in presence of NH_4Cl. Manganese is previously eliminated as will be described later, and one therefore has without much trouble a solution ready for titration with either potassium ferrocyanide in HCl solution or with Na_2S in ammoniacal solution of a definite ammonia concentration.

The following is an accurate description of Voigt's rapid method:

One to 3 grams (according to the zinc contents) of the fine pulverized material are treated on the waterbath with 10 c.c. HNO_3 sp.gr. 1.2, and 20 to 30 c.c. of HCl sp.gr. 1.19. In case of material rich in silica, it is advisable to use a porcelain dish instead of a beaker to make it possible to crush the gelatinous SiO_2 with a pestle in order to make the inclosed undecomposed material accessible for the acid. The contents of the beaker or porcelain dish are then rinsed in a 300-c.c. flask, neutralized with NH_4OH, after which 30 c.c. concentrated ammonia and 30 c.c. of a saturated NH_4Cl solution are added. Silica, iron, aluminum and practically all of the lead are precipitated in one operation, the zinc remaining in solution. The contents of the flask, which have become already hot by the neutralization, are heated to boiling, cooled by running water and filled up with ammonia (1:3 or stronger) to 300 c.c. By using an ammoniacal solution of this concentration there is no danger of reformation of insoluble zinc silicate. After mixing well the precipitate is allowed to settle to the bottom, which it does quickly, after which two 100-c.c. portions, each corresponding to one-third of the original sample, are filtered off, using dry filters.

One of these quantities is kept for an eventual control determination, while in the other manganese is precipitated by adding bromine water to the ammoniacal solution and boiling. Before filtering off, aluminum (one gram usually) in the form of powder, is added and the solution is boiled slowly until, after a few minutes, all the copper is precipitated and the solution has become colorless. In case much copper is present, it is advisable to add at once two to three grams aluminum or even more, because if not enough aluminum is added, part of the cupric compound is not reduced to metal, but only to an *"ous"* compound, which is soluble in the ammoniacal solution. One adds further 5 c.c. of a solution of sodium sulphite (1:4) and a few cubic centimeters of diluted ammonia; the solution is boiled again and filtered off, using for rinsing into the filter and for washing an ammoniacal solution of sodium sulphite. The filtrate is neutralized with HCl and 10 c.c. diluted HCl (1:3) are added in excess. The volume of the solution applied for titration should be about the same in each instance (also in standardizing the potassium-ferrocyanide solution). The solution is, therefore, diluted to 150 c.c., heated to about the boiling point and titrated with a solution containing 21.63 grams ($K_4FeCN_63H_2O$) and about 14 grams ($Na_2SO_37H_2O$) to the liter (1 c.c. of this solution equals 0.005 gram zinc), using a solution of 9 grams ammonium molybdate in 1000 c.c. water as indicator.

It should be noticed that in titrating, the indicator solution frequently turns yellow at the start. However, the intensity of this yellow color decreases with the continuation of the titration and it is quite impossible to confound this yellow with the dark brown, which indicates the finish. I tried this method with a number of samples of different compositions, comparing it with a sure gravimetric method (complete quantitative separation of the accompanying elements and weighing the zinc as zinc phosphate), and the accompanying table gives the results obtained.

Considering the fact that in Europe in commercial analysis of zinc ores a difference of 1% is allowed, it may be said that the above results are very satisfactory.

RESULTS OF VOIGT'S METHOD FOR ZINC DETERMINATION

Material Analyzed	Analysis SiO_2	Al_2O_3	FeO	CaO	MgO	Pb	Cu	As	S	CO_2	Zinc Contents Gravimetric	Voigt's
Japanese blende	8.59	1.21	4.68	1.37	0.34	1.16	0.21	....	29.11	.....	51.62	51.63
Mexican complex ore	11.42	2.54	25.80	1.35	0.17	5.81	0.44	1.10	34.19	1.59	11.97	11.90
Poor oxide, Friedrichshütte	0.42	....	.....	.....	....	80.62	....	....	.....	.....	9.65	10.00
Zinc oxide, Oker an Harz	0.10	0.39	0.21	.....	....	4.59	....	....	.....	.....	72.11	72.50
Oker slag	7.98	3.80	39.56	..*	1.40	0.86	1.09	....	10.26	.....	18.02	18.25
Zinc dust residue, from dyeing	4.23	0.96	0.58	30.70	3.13	1.23	tr	....	.....	.....	23.08	22.75
Poor French calamine	2.42	1.22	18.38	12.87	9.40	4.65	tr	....	.....	27.37	9.61	9.85

* 9.88% of BaO.

Prevention of Piping in Steel Ingots

At the New York meeting (February, 1913), of the American Institute of Mining Engineers, the question of producing sound steel ingots occupied much of the attention of the Iron and Steel division. To the question put before the meeting: Whether it was commercially practicable to produce sound steel ingots, there seemed to be but one answer, that it was. L. E. Howard, of the Simonds Manufacturing Co., stated that they were using the split molds (Talbot process, cf. ENG. AND MIN. JOURN., Dec. 7, 1912, p. 1064), allowing the ingot to cool so as to present a solid exterior, and rolling while the interior was still molten. They had begun on 15-lb. ingots, and had gone steadily up the line, working now on 600-lb. ingots. The added cost was about 3% of the ingot's value. J. E. Stead, of Middlesbrough, England, in a written discussion, states that to obtain the best results, the ingot should have almost completely solidified before rolling.

H. D. Hibbard, of Plainfield, described the Hadfield process (cf. ENG. AND MIN. JOURN., Dec. 7, 1912), including an ingenious modification in which the ingot-mold car carries a portable blower, i.e., each car unit is self-contained. In the Hadfield process a sand or clay feeding-head is using on the mold, and the steel is kept hot by putting a layer of slag on top of it, and on top of that a layer of carbonaceous fuel, of which the combustion is urged by forced draft. Over 20,000 tons had been produced by this process, and there was not an

unsound ingot in the lot. The waste (due to cropping) is cut to 9%, so there is economy in the process.

Anti-piping thermit was advocated by E. A. Beck (cf. ENG. AND MIN. JOURN., Dec. 28, 1912, p. 1220) and opposed by N. Petinot, who stated that in the use of aluminum as a degasifier and deoxidizer, sufficient account was ordinarily not taken of the effects of the alumina produced. This was infusible at any temperatures reached by the molten steel, and often remained entrained in the product, giving rise to zones and lines of weakness after rolling. He advocated the use of ferrosilicon for preliminary deoxidation, finishing with the use of ferrocarbon-titanium.

Emil Gathmann, of Baltimore, Md., contributed a paper on his patented process of casting ingots big end up, with a thick mold wall at the bottom, and thin at the top, thus cooling the bottom quickly and allowing the top to remain liquid, acting as a feeding head. By this means, sound steel is left after a discard of 12%.

G. H. Clamer, of Philadelphia, showed an ingenious experimental device, in which a small electric furnace of the resistance type is formed of the top of the ingot. A steel electrode, surrounded by a magnesite block, is lowered into the molten metal. There is a hole in the block by which the molten steel comes in contact with the electrode. There is a current of molten steel set up, flowing out through the center of the hole and in at the circumference (the so called "pinch effect"), thereby maintaining the top of the ingot molten.

Henry Hess, of the Hess-Bright company, added a humorous touch to the discussion, by stating that he had made numerous experiments on preventing piping, using glass molds and casting resin ingots and had discovered that he could put the pipe wherever he pleased, even on the outside of the resin ingot. Having succeeded in this, he built an ingot mold, cast a steel ingot, and had a photographer on hand to take photographs as the ingot was planed off in $\frac{1}{16}$-in. layers. The first cut showed a cavity six inches deep, right where it oughtn't to be. Since then he thought it best to experiment on materials more closely approaching the melting point of the finished product.

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Self Starting Direct Current Motors

By the use of a heavier compounding winding, which reduces the flow of current when starting, direct-current motors have been made self-starting, thereby increasing their value for mine service. While it was previously possible under some conditions to start motors driving pumps and fans from the power house, most of them had to be started by hand. Therefore, when the power went off temporarily the motors stopped, necessitating going to each station to start them again.

With the new self-starting motors, however, when the power comes on after a temporary stoppage, the motors start automatically. Starting boxes are unnecessary and only simple wiring is required. Aside from an occasional visit of inspection the motors require no attention. Self-starting motors are made by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penn., in ratings up to 20 hp. for the voltages usually employed in mine work.

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The Mansfelder Kupferschieferbauende Gewerkschaft in its prospecting operations with a diamond drill is reported to have struck a good body of copper ore at the southwestern boundary of its concession at a depth of 1902 feet.

New York Curb Market in 1912

The accompanying table shows the 1912 transactions in all listed mining stocks on the New York Curb. Mining transactions totaled 12,689,773 shares, as against 11,772,314 in 1911 and 34,172,548 in 1910, as reported by the Curb Quotation Co., but these figures are probably about 1% low. A number of mining bonds are also sold on the Curb, total 1912 transactions equaling $3,441,000.

The general tendency of the Curb in the last year was toward a wider dealing in industrial securities, especially in the numerous issue of new stocks floated during the year, and consequently mining stocks were somewhat neglected. The feature of the year was the collapse of the Porcupine boom.

NEW YORK CURB SALES IN 1912

Shares Sold	Company	Open	High	Low	Last
87,705	Alaska Gold Mines	7½	13¾	7⅛	13½
34,300	Am. Gold Porcupine	.30	.37	.30	.32
1,600	Bear Top Orofino Con	1	1⅛	1	1⅛
163,600	Beaver Con	.44	.50	.36	.43
588,576	Braden Copper	5⅞	10⅜	5	10⅜
137,903	Brit. Col. Copper	4½	6¼	3⅞	4⅝
31,506	Buffalo Mines	1½	2⅛	1⅛	2
171,800	Butte & New York	⅜	2⅜	⅛	1¾
49,450	Butte Coalition	23¼	23⅞	21⅛	23
34,050	Caledonia Mining	.73	.80	.32	.40
100	Calaveras	3⅜	3⅜	3⅛	3⅛
81,400	Chesterfield Cop	15	15	9	9
500	Colonial Silver	3/16	3/16	3/16	3/16
399,600	C. O. D. Con	.14	.14	.04	.07½
192,450	Con. Ariz. Sm., new	7/16	11/16	⅜	½
1,200	Crown Reserve	3	3½	3	3½
60,185	Davis-Daly Copper	⅞	3	⅜	1 13/16
142,059	Diamondfield Daisy	.13	.16	.03	.05
313,000	Dia. Black Butte	.12	.12½	.03	.05
770,045	El Paso Con	.73	1¼	.72	1¼
85,921	El Paso new	6½	6¾	5¾	6⅝
604,700	Ely Consolidated	⅜	⅜	.09	.11
14,090	First Natl. Copper	3	4½	1½	1⅞
88,110	Florence	.60	1¼	.52	.58
243,416	Giroux Mining	4½	6¾	3¼	3 13/16
71,970	Gold Hill Con	⅛	⅛	⅛	¼
142,700	Goldfield Mining	7½	8	5	7
266,663	Greene-Cananea, new	8¼	11	7½	9
50,,050	Greenwater Cop	.05	.09	.04	.04
4,535	Guggenheim Exp	190	232	178	223
300	Guggenheim Ex., new	56	56	55	55
80,700	Inspiration Cop	10⅜	10⅞	10	10
123,370	Inspiration Con., new w. i	21½	21⅝	17⅞	19¼
140	International Nickel, new	127	127	124	124
190	International Sm. & Ref	115	128	123¼	124
530,500	Jumbo Extension	.24	.58	.20	.33
59,435	Kerr Lake	2⅜	3¼	2⅛	2⅜
11,500	Keystone Copper	2⅞	3	1⅞	2 9/16
200	Live Oak	2⅜	2⅜	2⅜	2⅜
2,700	La Grange Placer	2⅜	2⅜	2⅜	2⅜
157,230	La Rose Con	3 13/16	4⅛	2 7/16	3
7,000	Lightning Creek G. D	2⅜	2⅞	2⅛	2⅜
405,660	Man. Big Four Min	.48	.75	.38	.75
113,910	Mason Valley, new	11⅞	14½	10⅜	10¾
137,710	McKinley-Darragh	1 11/16	2¼	1⅛	2
17,050	Mines Co. of Am., new	4	4	2⅞	3
72,450	Motherlode Gold	15/16	1⅛	13/16	15/16
196,860	Mutual Mining Co	.71	.73	.42	.60
159,250	Nevada Hills	2⅛	2 13/16	1¼	1 7/16
22,215	Nevada-Utah M. & S	⅜	⅜	.03½	.03½
15,400	Night Hawk Lake	.14	.15	.12	.12
151,976	Nipissing Mines	6⅛	9⅛	5⅜	9⅛
9,050	North Butte Devel	¼	⅜	.23	.30
49,300	N. J. Mines Co	.17	.18	.15	.17
217,475	Ohio Copper	1	2⅛	¼	1⅛
7,050	Ohio Copper 1st pfd	⅞	15/16	⅜	⅞
304,200	Pacific Smelters	¼	⅜	⅛	3/16
38,200	Porcupine Central	3½	5 5/16	.40	.40
134,400	Porcupine Northern	¾	2¼	.12½	.14
68,756	Porcupine Southern	1 1/16	2½	.15	.15
1,000	Porcupine Townsite	.50	.52	.47	.47
185,250	Preston East Dome	.13	.13	.05	.05½
79,545	Puebla S. & R	1½	2¼	1½	2¼
169,671	Ray Central	1⅜	2⅜	1⅜	2⅜
500	Sierra Con	1½	1½	1½	1½
53,167	Silver King Con	1.15	1 5/16	13/16	1 13/16
13,736	South Live Oak	2⅜	4⅜	1¼	2
4,000	Silver Leaf	.04	.04	.04	.04
115,850	South Utah	⅜	1⅜	5/16	⅜
215,671	Stewart Mining	.90	2¼	.90	2¼
1,000	Timiskaming	.43	.43	.41	.41
988,391	Tonopah Merger	1 3/16	1⅜	.71	.84
268,118	Tonopah Extension	1 7/16	3	1⅜	2 5/16
562,841	Tonopah Mining	7⅛	8¼	6	6 7/16
69,284	Tri-Bullion	⅜	1	¼	⅜
750	Trinity Copper	8¼	8¼	5 1/16	5 7/16
170,635	Tularosa	⅜	1⅜	⅛	1
93,710	Tuolumne Copper	3⅝	4⅜	2⅜	3¼
93,560	Union Copper	⅛	3/16	⅛	3/16
17,665	United Copper	1⅜	3⅜	1¼	1⅜
100	United Copper pfd	10	10	10	10
400	War Dance	¼	¼	¼	¼
48,970	West End Con	1¼	1 13/16	1	1¼
246,400	West End Exten	23	40	15	15
729,100	Wettlaufer	88	89	22	25
140,952	Yukon Gold	3¼	4	3	3⅜

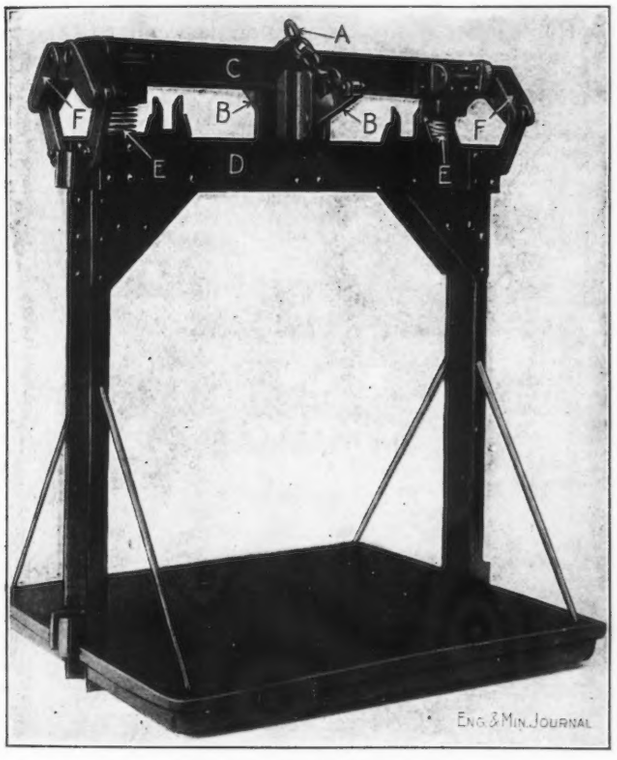
DETAILS OF PRACTICAL MINING

Hinkle Safety Device for Cages

By Albert F. Plock*

An improved form of the standard safety catch for mine cages has been patented by Peter Hinkle, of Ashland, Kentucky.

Though the design is especially intended for automatic skips, used for blast-furnace charging, which operate between guides, much as do cages, the accompanying illustration shows the device applied to a blast-furnace cage, which is not essentially different from a mine cage.



Cage Equipped with Hinkle Safety Catch

Referring to the drawing, the hoisting rope is attached to the chains *A*, and the action of the rope-pull through the levers *B* is such as to bring the channel *C* toward the I-beams *D*, working against the springs *E*. As *C* and *D* are brought together, the points of the catches, or dogs *F*, are forced apart and release their grip on the guides. In case of a rope-break, the pull is released, the powerful springs *E* separate *C* and *D* and the dogs grip sharply on the guides. In the illustration, the dogs are shown made with a smooth face for steel guides, which, however, could be changed to some corrugated form for acting on wood.

This form of safety catch would seem to be especially powerful, simple and effective and offers an excellent suggestion for metal-mine cage design.

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Repairing Wood Pipe

To those who contemplate installing a pipeline of wood-stave pipe the description of a rather unusual break and the method of repairing it may be of interest.

The occurrence is described by R. K. Tiffany in *Eng. News,* Feb. 6, 1913. The pipe in question was two miles long, and 55 in. in diameter, carrying approximately 100 cu.ft. per sec. under a head varying from 40 ft. to 190 ft. Of the entire line, 1500 ft. had a diameter of only 48 in., and of this 500 ft. lay from three to six feet under the bed of the Yakima River. In the winter of 1910-11 some leakage was discovered when it was undertaken to fill the pipe by pumping, as after a pressure of 40 lb. was reached it was impossible to raise the water farther.

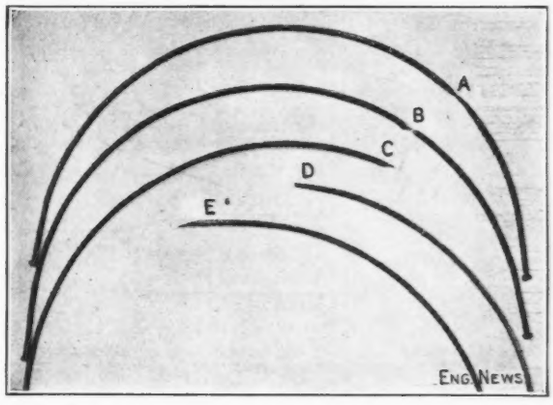

Fig. 1. Wood-stave Pipe Bands Severed by Erosion

Fig. 2. Enlarged View of Erosed Steel Band

The following summer two breaks occurred which liberated about 15 cu.ft. of water per sec., in the middle of the river 8 to 10 ft. under water.

Toward the close of the season the services of a diver were secured and it was found that the two leaks were similar, being roughly triangular in shape, with an area of 16 to 24 sq.in. each. They had occurred at the ends of staves and at each point two of the steel bands were found to be entirely severed and a third almost so by the erosive action of the silt and sand in the water. A third smaller leak which was found, apparently showed the beginning stage of the larger ones. At this third leak a small hole was eroded at the end of a stave, the water apparently following around the metal tongue and a band being already slightly eroded, and had this not been repaired in time it seems probable that a break similar to the other two would have occurred in the near future. It appears that the erosion cut one or more bands, and the end of

the stave was then broken off by the water pressure. Figs. 1 and 2 are views of the severed bands.

The breaks were repaired by placing plates of ⅜-in. steel inside and outside of the pipe at each break, the inner plate having its smallest dimension equal to the largest dimension of the opening in the pipe, both plates being curved to fit the pipe, with rubber gaskets between the plate and the staves. These plates were drawn together by a ¾-in. bolt through their centers. New bands were placed where the old ones had been destroyed, passed over the outer plate and then cinched up as tight as possible. Before the diver left, a full head of water was turned in and the pipe carefully sounded and inspected throughout its entire length. Under the river, at one of the places repaired, a very small leak appeared, but this was entirely stopped by placing several sacks of sawdust and alfalfa meal in the pipe through a manhole at the north end of the river crossing, and then turning in a small head of water.

The entire cost of the repairs made by the diver, including all labor and material, was $1260. The greater portion of the time was spent in removing the material from around the pipe, so as to be able to get at the band connections and to get sufficient room to work in placing the patches. Several plans were tried, but it finally became necessary to install a 6-in. sand pump on a scow, and remove the material through the suction hose.

It is a noticeable fact that these three leaks all occurred in the upper third of the pipe and it was also noticed that there were numerous very small leaks in the upper third of the exposed portion of the pipe south of the river, and practically none in the lower two-thirds. This may be due to the fact that the velocity of the water up to the present time has been only 2 to 4 ft. per sec., and a certain amount of fine silt has been deposited on the sides and bottom. This would, of course, have a tendency to fill all small leaks, except in the top. It is, therefore, proposed to feed into the pipe from time to time a few sacks of fine sawdust, bran, alfalfa meal, or something of a similar character for the purpose of plugging any small leaks before erosion sets in. An 18-in. manhole has been placed near the river margin at each side of the crossing, and it is believed that similar leaks may be stopped, should they occur in the future, by pumping the water from the pipe under the river and making repairs on the inside of the pipe, provided they are discovered before any bands have been destroyed.

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Gas Engine Troubles

Despite the fact that the gas engine is now almost as widely used as the steam engine and its peculiarities nearly as well understood, it is still capable of bucking and causing troubles at times. To those who experience such vexations, the accompanying table of 35 varieties of trouble, enumerated by H. Locke, in *Power*, Jan. 21, 1913, may prove interesting.

GAS ENGINE TROUBLES

Difficulty	Cause		
Difficult starting	Incorrect mixture	Mixture too weak owing to insufficient gas	(1)
		Mixture too rich owing to insufficient air	(2)
	Defective ignition or failure to ignite	Tube not properly heated	(3)
		Timing valve incorrectly adjusted	(4)
		Vibrator out of adjustment	(5)
		Sparking plugs too far apart or dirty	(6)
		Wire disconnected or short circuit	(7)
		Batteries weak or coil defective	(8)
	Engine too cold; see lines (9) and (10).		
	Incorrect mixture; see lines (1) and (2).		
	Defective ignition; see lines (3) and (8).		
Lack of power	Engine too cold	Jacket water turned on too freely or too soon	(9)
		Water lodging in cylinder, leaky jacket joint	(10)
		Defective circulation of cooling water or insufficient supply	(11)
		Faulty lubrication	(12)
	Engine too hot	Exhaust cam worn, causing insufficient opening of exhaust	(13)
		Mixture too rich	(14)
		Too high compression owing to carbon deposit	(15)
	Leakage during compression	Piston rings worn or sticking in grooves	(16)
		Liner worn or grooved	(17)
		Leaky valves	(18)
	Ignition too late.		
Pounding and knocking	Parts of engine loose or worn	Connecting rod or main brasses slack	(19)
		Flywheel loose	(20)
	Moving parts striking an obstruction.		
	Broken piston ring.		
	Spark advanced too far.		
	Spark too early.		
	Cylinder and piston overheated; see lines (11) and (15).		
Preignition	Too high compression.		
	Glowing carbon or metal points in the cylinder and burning gas	Pockets for gas to accumulate	(21)
	Ignition uncertain.		
Backfiring	Delayed burning of previous charge	Pockets for gas to accumulate	(21)
	Incorrect mixture	Too much air	(22)
	Valve timing wrong, inlet late in closing.		
	Leaky inlet valves.		
Explosion in exhaust pipe	Accumulation of unburnt gases	Previous charge too rich	(23)
		Ignition uncertain	(24)
	Exhaust valve leaky	Valve or seat bad	(25)
		Dirt under valve face	(26)
		Weak spring	(27)
	Exhaust opens early	Incorrect timing	(28)
Poor speed regulation	Variation of gas pressure	Gasometer body balanced or rusted in guides	(29)
		Irregular working of plant	(30)
		Leakage of air in producer	(31)
	Pallets on striker worn.		
	Governor stiff or worn	Want of lubrication	(32)
		Poor adjustment	(33)
Excessive fuel consumption	Incorrect mixture.		
	Engine too cold; see lines (9) and (10).		
	Leakage; see lines (16-18), and (25-27).		
Smoke	At end of exhaust pipe	Mixture too rich—smoke black	(34)
		Excessive cylinder lubrication—blue smoke	(35)
	Past piston.		

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In a Diesel Engine of Carels Design intended for marine use, it was found that only four tons of fuel were used per day as against 15 tons consumed by a steamer of the same capacity (Abst. from Intern. Marine Eng., "Eng. Mag.," Jan. 1913). The engine in question developed 100 hp. A saving of 80 tons in the weight of machinery was obtained over a steam installation, largely due to the absence of boilers. While the same figures might not hold for a stationary plant, yet the saving of weight in both the machinery and the fuel attendant upon the use of oil engines is necessarily great.

Diamond Drill Hole Model

By G. C. Bateman*

At the Dome mine in South Porcupine, during the years 1911 and 1912 about 20,000 ft. of diamond drilling was done. In addition to the regular records, it was considered advisable to have a model showing the location of all the holes and outlining the orebody as indicated by them. As the Dome orebody is large and somewhat irregular, it was necessary to have all the information possible in order to lay out the future development work to the best advantage. A scale of 50 ft. to the inch was adopted to correspond with the mine plans and a skeleton framework with a solid bottom was made which measured 30 in. in width, 50 in. in length and 20 in. in depth and was constructed of ordinary pine, as shown in Fig. 2. Around the inside of the top was nailed a ½-in. strip in the center of the frame work. A piece of wire screen with $\frac{3}{16}$-in. openings was cut the size of the framework and tacked to the under side of this projecting strip. On the top was placed a sheet of glass on

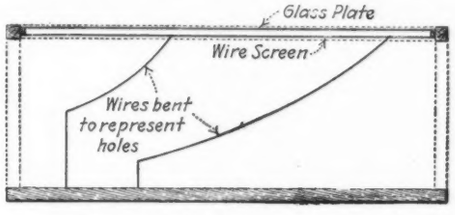

FIG.1

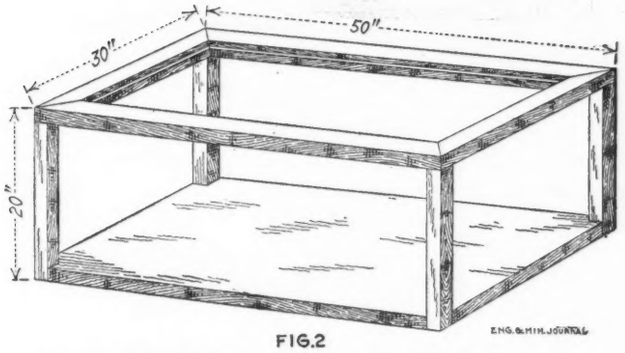

FIG.2

Model Frame and Section, Showing Wires in Position

which a surface plan was drawn. This drawing which was simply a tracing of the regular plan put on the glass with artists' oil-paints instead of ink, showed the buildings and surface works, the outline of the ore exposures and the location of all the diamond drill holes. These holes had, of course, been surveyed. The locations of the holes were then transferred by means of a plumb bob to the bottom of the model and their strikes laid off.

On a large sheet of paper, were drawn two parallel lines 20 in. apart to correspond to the depth of the model, and on this the different holes showing their correct dips from the horizontal, were projected to scale in vertical longitudinal section. Pieces of ordinary iron wire $\frac{3}{16}$ in. in diameter were then taken and superimposed on these projections of the holes. At the end of a line representing a hole, the wire was bent at right angles to the line representing the bottom of the model and cut off half an inch below it. The portion of the wire representing the hole was then painted white, and when this had dried, the points where payable ore had been cut were measured off on the wire and painted red. The vertical part of the wire was not painted, as it acted only as a support. When the wire was thoroughly dried, it was put into the frame as illustrated in Fig. 1. The upper part was put through a hole in the screen and held in place by a small saw-cut in its side which fitted over the wire of the screen. The other end was inserted in a small hole bored in the bottom of the model immediately under the end of the hole, on the line of strike.

All the diamond-drill holes were represented in the same manner and when the model was completed, there resulted an exact reproduction to scale, showing each individual hole with its proper location and angle. The red portion of the holes showed the orebody as indicated by drilling, while the plan on the glass top showed the orebody in relation to the surface equipment and present workings. To represent the shafts, small pieces of wood showing the depth of the shaft were painted black and hung in their proper positions, by tacks driven through the screen into the wood.

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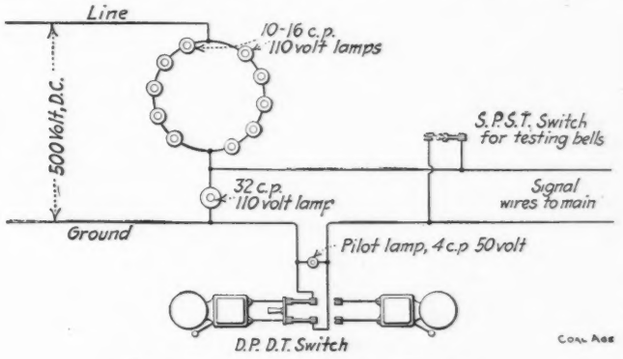
Simple Electric Signaling System

The accompanying sketch shows a simple system of electric signaling. The current for lighting, pumping, underground and surface haulage is 550 volts, d.c. This current, says Joseph Daniels, in *Coal Age*, Feb. 8, 1913, is utilized for signaling purposes. No. 12, B. & S. gal-



Layout for Signaling System

vanized-iron wire is carried underground and suspended from small porcelain knobs on plugs. A double-pole switch is provided at each level to cut out the signal wires below that point.

In the engine room the current to operate the gongs is supplied by shunting the ground light of a series of ten 16-cp., 110-volt lamps, as indicated in the diagram. Two series of lights are in the lamp bank rheostat, thus providing for accident in case one series should burn out. Two bells, a pilot light and a testing switch, as shown in the illustration, are installed on a board in front of the hoisting engineer. The bells are so arranged that either one may be used, in case the other is out of order, by simply throwing the handle of a double-throw, double-pole switch. The pilot light in connected in parallel with the bells and burns brightly at each signal, thus acting as a substitute in case the bell fails to ring. The single-pole switch, connected with the signal wires to the mine, permits the engineer to test the signaling system from

his station. Signals from the mine are sent by short-circuiting the wires in the slope. This is done by means of a copper spanner of ample width, so that the circuit can be closed and the signals given from a moving cage, skip or car.

The system does not require much labor, expensive apparatus or material to install, and its maintenance amounts to practically nothing. In case of any trouble in the mine repairs can easily be made.

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Efficiency of Wire Rope Fastenings

In a recent address before the Philippine Society of Civil Engineers, Clarence W. Hubbell, chief engineer of the bureau of public works, presented some valuable data on the results of tests made to determine the strength developed under heavy tension by bolted fastenings for steel cables. During the erection of a 340-ft. span suspension bridge, one of the 2-in. cables slipped through the clamp and caused a serious accident (*Eng. Rec.*, Jan. 25, 1913). As no data of the holding power of the cable clamps were available, tests were undertaken on steel cables fastened with clamps of standard types.

A 5/8-in., six-strand plow-steel cable was bent around a thimble and the ends secured to the standing part by a standard 5/8-in. Crosby clip of the U-bolt type, with the nuts drawn as tightly as possible by a 12-in. wrench. The cable slipped under a load of 8360 lb. In a second test with a new clip tightened with a 24-in. wrench, the cable slipped at a load of 10,020 lb., and after the nuts were again tightened, slipped at 12,380 lb. In a third test made with two new clips, the nuts were tightened under a load of 6000 lb. with a 12-in. wrench, and the load was increased to 21,710 lb., which broke the cable where it was in contact with the lower U-bolt. As the rated ultimate strength of the cable was 36,000 lb., it was thought to have been weakened by the distortion under the U-bolt, which was set in contact with the standing part, while the head took bearing on the free end. It was assumed that in practice the head of the clip should always be placed on the standing part of the cable and the U-bolt on the free end.

A 95-lb. cast-iron clamp, 33½ in. long, made in two pieces, with grooves fluted to receive the cable, and connected by five 1-in. bolts having a theoretical holding power of 19,500 lb., was placed on a 2-in. seven-strand galvanized steel-wire cable. The bolts were drawn as tight as possible by one man with an 18-in. wrench, and the cable slipped under a load of 12,000 lb. The nuts were tightened by one man with a 30-in. wrench, and a slip occurred under a load of 12,500 lb. The nuts were again tightened, and the third slip occurred under a load of 16,500 lb. The clamp was removed and replaced on the cable in a new position, and the nuts tightened by two men with a 30-in. wrench. The cable slipped under a load of 17,800 lb., and in successive tests under 12,700 and 15,000 lb. When tightened with three men on the same wrench, turning each nut from one-eighth to three-eighths of a revolution, the cable slipped at a load of 19,300 lb. In the last test the groove in the clamps had a diameter of two inches, permitting the cable to rest on the bottom of the groove.

A lighter clamp of different design had a groove 1¾ in. in diameter, designed to develop a wedge action increasing the bolt pressure when the clamps were forced together and the cable distorted enough to bear on the bottom of the groove. The clamp was 12 in. long, weighed 47 lb., was provided with five ¾-in. bolts and had a theoretical ultimate strength of 22,650 lb. for each half. The bolts were fastened by one man with a 24-in. wrench and no slip was apparent under a 10,000-lb. load. The nuts were tightened and the load increased to 20,900 lb. without apparent slip. The clamp was removed and found practically uninjured.

It was concluded that, first, where more than one clamp is necessary they should be placed as close together as possible, in order that the necessary adjustment of cables to bring them all into action shall be as light as possible; second, the clamp bolts should be tightened from time to time as the load is applied; third, the safe holding power of a cable clamp may be taken at about 3750 lb. per sq.in. of area of the bolts which secure the two halves of the clamp.

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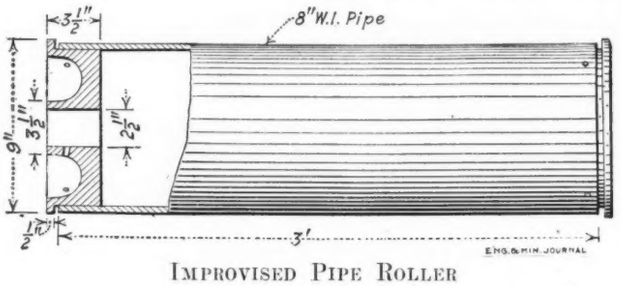
Improvised Pipe Roller

A desirable horizontal or vertical roller may be made from a piece of discarded air pipe by fitting the ends with castings, as shown in the accompanying drawing. These



IMPROVISED PIPE ROLLER

castings may be kept in stock for the several diameters of pipe, and in case there is considerable lateral movement to the cable tending to make it leave the roller, the casting should be made with high flange.

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Compressed Air Pipe Capacities

It has been found, in practice, that the square root of the fifth power of the diameter approximates the relation of pipe capacities for delivering air. For example, says Frank Richards in *Coal Age*, Feb. 15, 1913, a pipe of one-half the diameter of another has only one-fourth the area of the larger pipe; but it will not transmit one-fourth as much air, under the same pressure drop. For the same pressure drop, the ratio of air volume, in this case, will be

$$\frac{V_1}{V_2} = \sqrt{\left(\frac{1}{2}\right)^5} = \sqrt{\frac{1}{32}} = \sqrt{0.03125} = 0.176$$

Then, to transmit the same volume of free air, under the same drop of pressure, will require $\frac{1}{0.176} = 5.65$ of the smaller pipes. Or, say a pipe of twice the diameter of another will transmit 5.65 times the volume of air, with the same pressure drop, for any given distance and initial pressure. This difference becomes greater as the difference in pipe diameters increases. A pipe of only one-fourth the diameter of another will transmit not $\frac{1}{16}$, but $\sqrt{\left(\frac{1}{4}\right)^5} = \frac{1}{32}$ of the air volume, for the same initial pressure, pressure drop and distance.

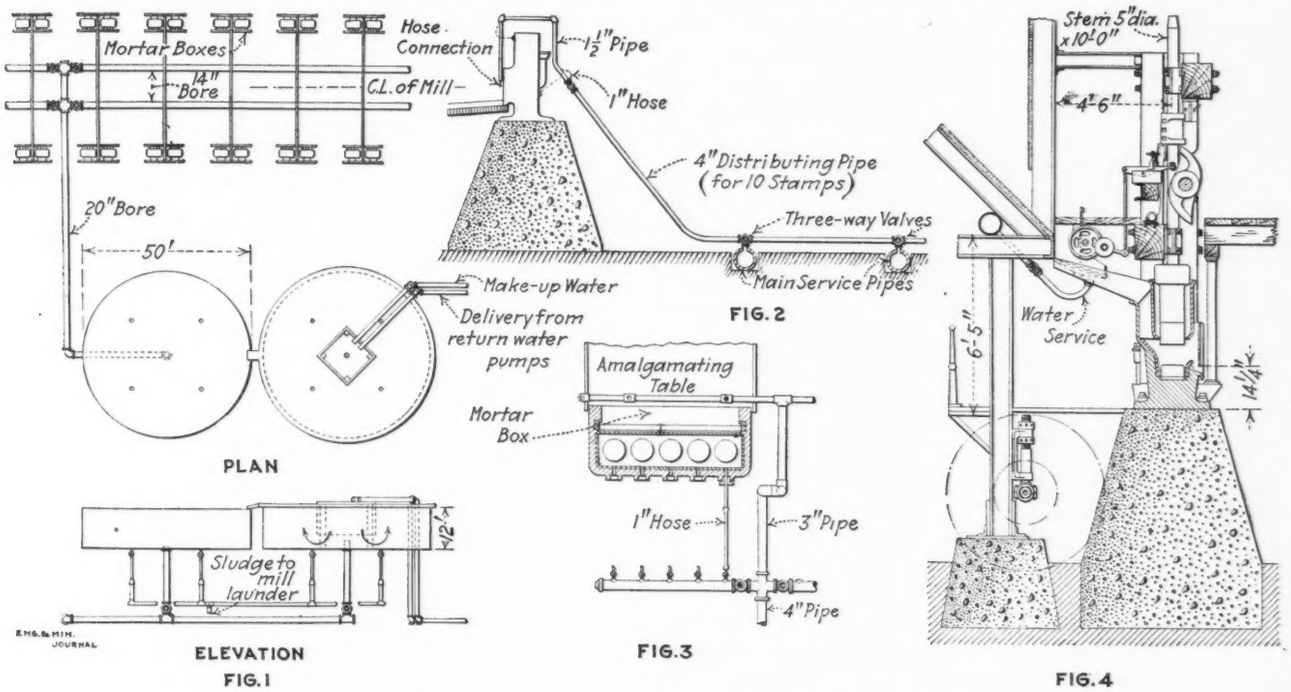
DETAILS OF METALLURGICAL PRACTICE

Stamp Battery Water Supply

The quantity of water required in a stamp mill depends upon the method of working, and as a general rule, it may be taken, that the amount of water used, in the large gold mills of the Rand, equals, according to C. O. Schmitt, in "A Textbook of Rand Metallurgical Practice, Vol. II," seven tons of water per ton of ore milled, but it may vary from four to 10 tons.

The water supply should be under a constant head or pressure, so that extra attention for regulating the quantity due to variations in the head will not be needed. As it is, the water supply requires continual adjustment to follow the changes in the screen used. In the usual mills on the Rand the greater part of the mill water is returned from the cyanide plant, and this is highly alkaline, while other impurities present. Fig. 1 shows the arrangement of a plant designed on this principle. The capacity of the storage vat should be equivalent to at least the 24-hr. supply, so that in case of failure of the return-water pumping plant the mill need not be stopped.

The main service pipes from the storage vat to and in the mill should be provided in duplicate, each capable of handling the whole supply, so that when one pipe is being cleaned out the work may proceed. The distributing pipes leading from the main service pipes to the mortar boxes should be so arranged that they can be taken out and replaced by a spare set in the shortest possible time, thus affording an opportunity for thoroughly cleaning the pipes taken out. All pipes should be of ample size to allow of a certain amount of incrustation before requiring cleaning, but, on the other hand, they should



RAND METHODS OF SUPPLYING STAMPS WITH WATER

the make-up water, that is, the quantity added to compensate for the loss in the cyanide plant, and which may be as much as 20% of the total, contains mostly acid. Where the two are mixed a reaction takes place, resulting in a precipitate. Arrangements should be made to perfect settling the precipitate prior to entering the mill service pipes, as the resulting incrustation will ultimately choke up the pipes. This can be effected by providing storage vats with a chamber where the two water supplies are mixed before entering the body of the vat. The mixing should preferably be in the center of the vat, so that the water can leave by a peripheral launder, gravitating to the second vat, from which it should be drawn at a point removed as far as possible from the inlet, so as to give every possible facility for settling the precipitate and not be too large, as the velocity of the water will then be very low, and the solid matter carried in suspension will settle more readily, increasing the rate at which incrustation takes place. It is a case of finding the happy mean between conflicting considerations. A velocity of 2½ to 3 ft. per second when the pipes are clean would seem reasonable. Fig. 2 shows an arrangement for distributing pipes that will give satisfactory results. Fig. 3 shows a detail of the piping at the mortar box.

Up to within recent years the water feed to the Rand mortar box, used to be by one or two pipes, either over the top or through the front of the box. The method now generally used consists of a separate jet for each stamp, so arranged that the water tends to strike the face of the die slightly behind the center line. It is assumed that the

jet of water so applied will remove all very fine material from the face of the die and aid in washing it through the screen, thus increasing the capacity of the stamp. The nozzles used should be at least 1-in. bore, as they are liable to choke, due to incrustation. Where there are two points at which water is fed to the mortar box, the main supply being through the back of the box by means of an individual jet to the face of each die, and an auxiliary supply to the front of the box above the head, the five jets are connected to a header by small closed pipes, the regulation being done in the pipe feeding the header by two valves or cocks. One valve is generally used for cutting off the supply, while the second valve, or cock, is used for regulating purposes, thus avoiding the necessity of again regulating the supply every time it is cut off. The same method of regulation is used for the auxiliary supply through the front of the mortar box. In Fig. 4 is shown the method of supplying water to a Nissen stamp battery.

Reclaiming Zinc and Lead Slimes

By Lucius L. Wittich*

The necessity of reclaiming the greater percentage of the economic minerals, if the thin sheet-ground mines in the Missouri-Kansas-Oklahoma district are to be operated at a profit, has caused the larger companies of the district to install "sludge" departments for the treatment of slimes; but the operators of the mines of the American Zinc, Lead & Smelting Co., at Webb City, Mo., have gone one step farther and are experimenting with the treatment of overflow waters from the sludge tanks. An additional plant, equipped with tables made by the James Ore Concentrator Co., of Newark, N. J., has been constructed, and at a small expense for operation, the new plant is producing on an average of 3000 lb. of galena and 6000 lb. of blende concentrates each week.

In former years the waste product from the first milling went to the dump heap and the water, carrying in suspension a heavy volume of zinc and lead, went into the sludge pond.

As a result it has been found profitable, in many instances, to re-treat the tailing piles, to clean out sludge ponds and remill the sediment and even to grind up the old boulder heaps that were once considered worthless; but the present experimental plant of the American company is the first undertaking at ore recovery after the mill water had already passed through a series of settling tanks and had apparently all the sulphides extracted.

After leaving the mill the water goes through three settling tanks, from which the sediment is treated on a series of tables in the first sludge mill. The overflow from these tanks then goes to a series of 10 new tanks, and although it is apparently free from metallic sulphides when leaving the first set of three tanks, the additional settling process has proved successful, and a recovery of both zinc and lead has been made, as mentioned above.

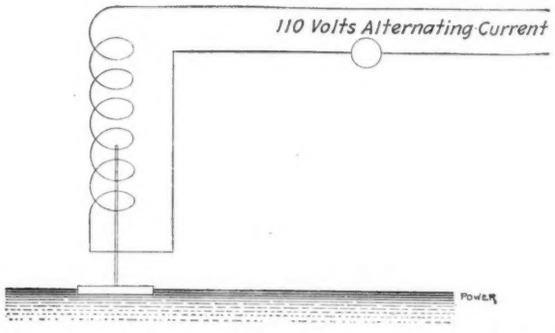
A Set of Smooth-faced Rock-crushing Rolls of remarkable size was recently built by the Traylor Engineering & Manufacturing Co., 30 Church St., New York, for the Rockland Lake Trap Rock Co., Rockland County, New York. The dimensions of the shells are 6 ft. diameter by 30-in. face, and the weight of the set is 280,000 pounds.

*Joplin, Mo.

Electrical Reactance Water Level Indicator

An extremely simple device for indicating water level in an unseen tank or reservoir is described by F. J. Storey in *Power*, Feb. 18, 1913.

It is a reactance coil having a movable core, actuated by a float, as illustrated, the water level being gaged by the brightness of the lamp, and is used to indicate the approximate height of the water in the forebay of a hydro-electric plant. Two 8-cp. lamps connected in parallel and placed side by side in a conspicuous position in the dynamo room were connected through 1800 ft. of No. 10 single copper wire to the reactance coil placed at the forebay up on the mountain side. The steel water pipe was used for the return circuit. The lamps burn brightly at low water and dim at high water



Reactance Coil in Circuit of Signal Light

and after a little experience the operator is able to judge very closely the intermediate points.

The difference in water level to be indicated was 20 in. The coil was 20 in. long, made by winding 13 layers of No. 18 cotton-covered copper wire on a piece of fiber tube of 7/8 in. inside diameter; core of 5/8-in. solid soft iron, 20 in. long or over. One 16 cp. or two 8 cp. lamps were connected in parallel and put in series with the coil. The supply was 110-volt alternating current.

Semi-pyritic Smelting at Bogoslowsk, Russia

By C. Stutzer*

The price of coke at the Bogoslowsk smeltery is $12.40 per ton. The composition of the charge is: SiO_2, 28.14%; Al_2O_3, 7.65; Fe, 24.08; Cu, 6.44; S, 10; CaO, 11; MgO, 1.81%. The average coke consumption with such a charge was 7% of the total. Owing to the cost of the fuel some means were sought for to replace part of this coke.

After trying the local lignite, costing about 90c. per ton, it was found to answer very well the smelting requirements, and a portion of the coke was replaced by it.

The average fuel consumption is now 5% of coke and 5% of lignite, a considerable economy. The lignite analyzes: H_2O, 15.77%; volatile combustible, 31.81; fixed carbon, 45.49; ash, 6.47%. The matte grade remained unchanged after the alteration in fuel.

*Assistant manager, Bogoslowsk Smelting Works, Perm, Russia.

NOTES FROM CURRENT LITERATURE

Humphrey Direct Acting Gas Pump

Five large Humphrey pumps, with a total capacity of 180,000,000 gal. per day, have been installed to deliver water from the river Lee to a new reservoir for the London water-supply system, according to the *Canadian Engineer,* Dec. 19, 1912. The nature of the Humphrey pump was fully described in the JOURNAL, Feb. 18, 1911. It is essentially an internal-combustion machine with the explosion in direct contact with the water to be lifted. The larger size of these London pumps with a capacity of about 27,800 gal. per min., has a vertical combustion chamber and valve box, 7 ft. in diameter, connected by a 6-ft. play pipe to a water tower and delivery main. The action of the pump is as follows: Suppose a compressed charge of gas above the water in the combustion chamber. On ignition the explosion forces out the whole body of water in the chamber and play pipe till it rises in the tower. The momentum of the water carries it beyond a position of balance; part of the water is discharged and a fresh supply, together with scavenging air, drawn into the combustion chamber; the mass then swings back and forces out the products of combustion while compressing the scavenging air to a cushion; the cushion expands and gives a second outward stroke, which draws in an explosive mixture; the second back swing compresses the mixture, which is ignited and explodes, giving renewed momentum to the mass of water and repeating the cycle. In most types of pumps it is endeavored to obtain as smooth a flow of the water column as possible. In this case the troublesome oscillations are made use of to control the movements of the pump. The entire absence of moving parts except in the valves, is a point of high importance. The pump works on producer gas and is guaranteed to deliver an actual water horsepower-hour on 1.1 lb. of coal. Ten tons of water are delivered on each explosion.

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The Mount Royal Tunnel, Montreal

The Canadian Northern, in order to enter the city of Montreal, found it advisable to tunnel under Mount Royal and part of the city. While the tunnel is in process of construction, the plans are not complete. It is probable, however, that both twin tunnels and double-track sections will be used. The standard clearance will be 17½ ft. above the rail and 6 ft. off the center line of track. The method of excavation adopted, according to the *Canadian Engineer,* Jan. 16, 1913, is tha[t] of a bottom center heading, 9x10 ft., with breakups at intervals, where the full-sized tunnel section will be developed. At these breakups, "jumbo" timbers will be set so that traffic can be maintained and the upper portion of the tunnel stoped down and run directly into cars.

Reciprocating drills with a water connection are used, being mounted on a horizontal bar at present, although it is intended to handle the full drilling outfit for each heading on a carriage. The cars have a 3-ft. gage with a 3-ft. wheel base, 18-in. wheels and springs on the axles. Both gasoline and electric locomotives will be employed. Part of the muck will be used for concrete and ballast, and the rest for fill and subfoundation work. Electric firing is employed, but an effort is being made to get special fuses with electric igniters, so that the cut may be fired electrically, at the same time igniting the time fuses of the relievers and the line holes.

In the shafts are used counterbalanced, automatic-dumping cages, with electric hoists. Most of the power is electric, but the pumps, drills and some small motors are run by air. The compressor plants at each end consist of one direct-connected, cross-compound unit of 2200 cu.ft. per min. capacity, driven by a synchronous motor and three cross-compound units of 1100 cu.ft. per min. capacity, belt-driven by induction motors. At present the average progress at the west end is 20 ft. per day. In the east end, the ground is rather bad, requiring timbering, and no shooting is allowed at night because of public annoyance, so that the average progress there for the last two months was 12 ft. per day.

❋

Goltra Process for Concentrating Iron Ores

The E. G. Goltra process for treating iron ores, which is being practiced at Waukon, Iowa, was described by E. G. Spilsbury before the Institute of Mining Engineers (*Bull.* A. I. M. E., December, 1912). The orebody is a clay bed containing nodules of hematite of all sizes, from large boulders down to small grains. It is mined by steam shovel, and the iron content of the mass, as mined, is 22 to 26 per cent.

The concentrates from this material run from 55 to 59% of iron, and are physically in a condition remarkably desirable for the blast furnace. The ore delivered from the shovel is brought down to the mill, and after screening so as to take out the largest boulders, which go to a crusher, the whole mass is delivered into horizontal revolving driers, 155 ft. long and about 10 ft. in diameter. The secret of the process depends a great deal on the preliminary heating, which must be so graduated as to prevent balling up the clay. The endeavor is to dry the materially gradually in such manner that the clay is left in a finely divided state. A blast is introduced at the discharge end of the rotary kiln and blows out all of the clay dust with a comparatively small percentage of iron. The ore, as it progresses toward the discharge end, is gradually raised to a high heat, and as it comes from the kiln is plunged in water and then runs through revolving screens.

The oversize from these screens is delivered to a long picking belt. The process of roasting and plunging in water shows up the chert and quartz thoroughly so that they are very easily picked out. The fines passing through the screen go to a second rotary kiln, which is hermetically sealed and into which a certain amount of oil for fuel is admitted. The result of this second heating

in a reducing atmosphere is the production of a magnetic oxide. This product then goes to the magnetic separators, which are of the Ball-Norton type. At the time of the writer's visit all of the difficulties from the practical operation of the process had not been entirely overcome, but he considered that it had the elements of success in it. No treatment was being given the flue dust resulting from blowing out the fine clay, but experiments had been made on a pneumatic concentrator on this material which had given good results, and with such concentrators introduced, the losses of metal will be small.

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The Price of Vanadium

Regarding a complaint that the price of vanadium is too high to permit of an extensive use, the International Vanadium Co. makes a statement in the *Mining Journal* of Feb. 1, 1913.

The price of vanadium (about 10s. per lb.) is high, having regard to quotations for other metals used by steel makers as alloys. The point to be considered, however, is not the price per pound, but the additional cost imposed by reason of the use of the individual metal. In the case of vanadium, the action is so potent that a small proportion insures the desired results, and indeed any admixture of quantities approximating to those used of such other cheaper metals, as tungsten, chromium, or nickel, would produce a steel probably unfit for use. Taking vanadium at the present price (to which it has fallen from a figure of about 25s. ruling three years ago), the cost of producing vanadium forging or spring steel is appreciably less than that of 3% nickel steel for the same purposes, even allowing for the value of the nickel-steel scrap.

The view that the use of vanadium is limited is somewhat erroneous, the opinion being advanced that over 75% of the better known high-speed tool steels now manufactured in Sheffield contain vanadium as an ingredient. The International Vanadium Co. also believes that the nature of the occurrence of vanadium is such that there is no reason to believe that the cost of the metal will be reduced for some time to come.

❖

Electrolysis of Nitric Acid Solutions of Copper

It is practically impossible to deposit all of the copper from a nitric-acid solution either on a stationary or a rotating cathode. According to J. H. Stansbie, lecturing before the Farady Society (*Chem. Trade Journ.*, Jan. 25, 1913), the reason is shown in some experiments of his with copper-covered cathodes when no current was passing. A thickly plated cathode was immersed in 50 c.c. of solution containing 10 grams HNO_3 and less than 0.1 mg. HNO_2, and rotated one hour, dissolving 6.5 mg. of copper. It was then placed in a similar solution without rotation. In one hour 780.6 mg. were dissolved. It was then rotated two hours, 15.4 mg. dissolved. Then remaining at rest for two hours, it lost 3486.3 mg. The experiment was kept at room temperature.

It is well known that nitrous acid plays an important part in dissolving copper. In solutions containing traces of nitrous acid the action is slow at first, but increases in rapidity as the amount of nitrous acid increases. If this is allowed to remain on the surface of the metal the general reaction is accelerated, if thrown off into the mass of the solution by a rotating cathode, it is hindered.

In the electrolysis of copper nitrate, nitrous acid is formed, and at last dynamic equilibrium is reached, after which deposition and re-solution are equal. This point is reached later with rotating cathodes.

Before the introduction of the rotating cathode, the author used to evaporate the nitric-acid solution with sulphuric, before electrolysis. With the rotating cathode it is sufficient to keep the nitric acid low and add 2 or 3 c.c. of strong sulphuric acid. To prevent re-solution when the current is broken, he stops the rotation and directs a jet of water from a wash bottle against the cathode as he lowers the solution beaker. The action of sulphuric acid is probably twofold: In helping to carry the current and prevent the formation of HNO_2; it probably forms a nitro compound which exerts less solvent action than does nitrous acid itself.

❖

Future of Germany's Coal Production

In a paper read before the Berlin Association for the Furtherance of the Study of Natural History, reported by *The Mining Journal*, Prof. Dr. Walther, of Halle, states that while, at the present rate of consumption, the Pennsylvania coal fields will be exhausted in about 100 years, and those of England in 300 years, France is likely to have a sufficient coal supply for about 500 years to come. Germany's position in this respect is considerably better, although in the Zwickau district of Saxony coal mining will have to be given up in about 150 years, and in Lower Silesia in about 250 years. In the Ruhr district, however, the coal reserves will last for at least another 700 years, and the same may be expected from the Saar district. The best prospects of all are for Upper Silesia, where the occurrence of highly payable coal measures has been proved to a depth of 2000 m. and more. There the average temperature is about 70 deg. C. Though it is, in the present state of mining technics, impossible for human beings to work in such a temperature, it may be confidently asserted that Upper Silesia will be able to supply Germany with coal for at least a thousand years.

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Wehrlin Process for Anode Mud

A process for the complete separation of the metals in anode mud has been patented by Harry Wehrlin, of Steglitz, Germany (U. S. pat. No. 1,049,013). In his process the mud is subjected simultaneously to the action of sulphuric acid, hydrofluoric acid and an oxidizing agent, and heated to about 70° C., while passing a current of air through the liquid. The precious metals are not affected; lead is transformed into an insoluble sulphate; antimony and copper form fluorides and sulphates; and arsenic is distilled off as its fluorine compound and is recovered by condensation of the vapors. The lead sulphate, silver and gold are then separated according to well known methods, while first the copper and then the antimony are recovered from their solution by electrolysis. The saving by the process is supposed to arise in the immediate division of the slime into the three groups of metals.

California Iron Deposits

The numerous iron deposits of California have received but little attention, owing to their distance from fuel supply and from the points of consumption, says the U. S. Geological Survey. The deposits at Minaret, Madera County, Calif., on the summit of the Sierra Madre, are said to be among the largest in that state and perhaps in the West. Probably next in size, but of greater commercial importance, are the Eagle Mountain deposits, in Riverside County, Calif.

The Eagle Mountain Range is one of a large number of bare ranges of rocky mountains in the Mohave and Colorado deserts. The higher peaks of the Eagle Mountains rise about 4000 ft. above sea level, and the edge of the desert that surrounds the range on the west, north and east averages about 1500 ft. above sea level.

The principal iron ores of the Eagle Mountains occur on the north limb of the dome in a chain of discontinuous deposits, 6½ miles long, trending across the summit of the range in a northwesterly direction. They extend three miles west of the summit and 3½ miles east. The ore-bearing zone reaches in places a width of 4000 ft., but individual ore deposits do not exceed 500 ft. in width. A moderate estimate of the ore available in the deposits now exposed, assuming that they extend several hundred feet down, is about 60,000,000 tons, most of it high-grade.

No iron ore has been mined in the district, the principal obstacle to the establishment of the iron industry in southern California being the absence of fuel. The nearest deposits of coking coal are in Colorado, the lignites and bituminous coals of Washington and Oregon being unsuitable for this purpose. It seems likely, however, that before many years extensive mining operations will be started in the Alaska coal fields, and then large quantities of coking coal will be shipped to Pacific coast ports, thus making possible the establishing of blast furnaces and steel plants.

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Geological Survey Appropriations for 1913

WASHINGTON CORRESPONDENCE

The sundry civil bill, just reported to the House of Representatives by the appropriations committee of that body, furnishes the following appropriations for the coming year for the Geological Survey. It is believed that some additions are likely to be made in the Senate, but there is no information as yet as to the probable action of the House with reference to them.

Office of the director: Director, $6000; chief clerk, $2500; chief disbursing clerk, $2500; librarian, $2000; photographer, $2000; assistant photographers—one $900, one $720; clerks—one of class two, three of class one, one $1000, four at $900 each; four copyists, at $720 each; watchmen—one $840, four at $720 each; janitor, $600; four messenger boys, at $480 each; in all, $35,340.

Scientific assistants: Geologists—two at $4000 each, one, $3000, one, $2700; two paleontologists, at $2000 each; chemist, $3000; geographers—one, $2700, one, $2500; two topographers, at $2000 each; in all, $29,900.

General expenses: For every expenditure requisite for and incident to the authorized work of the Geological Survey, including personal services in the District of Columbia and in the field, to be expended under the regulations from time to time prescribed by the Secretary of the Interior, and under the following heads, namely: For pay of skilled laborers and various temporary employees, $20,000; for topographic surveys in various portions of the United States, $350,000; for geologic surveys in the various portions of the United States, $300,000; for continuation of the investigation of the mineral resources of Alaska, $90,000.

For chemical and physical researches relating to the geology of the United States, including researches with a view of determining geological conditions favorable to the presence of deposits of potash salts, $40,000: for the preparation of the illustrations of the Geological Survey, $18,280; for the preparation of the report of the mineral resources of the United States, $75,000; for gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and the preparation of reports upon the best methods of utilizing the water resources, $150,000.

The bill also covers $2000 for the library, $110,000 for geologic maps and $75,000 for topographic surveys of national forests. The total is thus $1,295,520.

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The Valuation of Iron Mines

In J. R. Finlay's paper on the valuation of iron mines, at the New York meeting of the American Institute of Mining Engineers, the following line of argument was adopted. The principles of iron-mine valuation, are, of necessity, different from those underlying gold or copper mines. The latter are more or less independent of transportation, their value being dependent on the cost of production on the ground. Iron mines are dependent for their value on a neighboring industrial activity, and cheap transportation to the point of manufacture.

Gold and copper ores exist in somewhat limited quantity; iron ores are known to exist in quantities running into billions of tons. The question with iron is therefore not one primarily of ore supply, but of the price at which the ore can be sold and the amount that can be marketed each year. In iron mines an error of 10% in estimating the average price of an ore will make more difference in the valuation than any possible error in the life of the mine. So because of the overwhelming importance of the effect of price, Mr. Finlay undertook to investigate the basic factors which determine the price of iron-ore in a given field. For a given field, such as the Lake Superior ranges, the price of iron ore will be determined by the pressure of competition. The vital factors in the making of a field are: (1) Ores pure enough to be inherently desirable for iron smelting; (2) a great volume of such ores, sufficient to warrant a great investment; (3) the assurance that such ores can be placed in their natural industrial field as cheaply as ores from any other source.

The Lake Superior iron goes to a field which is a rough ellipse, the major axis extending from Philadelphia to Chicago, the minor from Lake Erie to the southern boundary of Pennsylvania. Pittsburgh is about the center. The Lake ore enters this region from the north and there meets its complement, the Appalachian fuel supply. The inference then is: If Lake ore can meet any competition as far east as Pittsburgh, it will supply half the ore used in this field. If it can meet outside competition all the way to the coast, it will supply almost the whole demand, and on this basis Mr. Finlay makes his argument, leaving out of account "the extraneous and gratuitous factors of taxes, royalties and profits" and considering only the fundamental factors of: (1) Cost of mining; (2) distances of transportation, by land and by water, of the Lake ores against any known rivals.

The average mining cost, including everything but the initial plant and taxes, seems to figure out at about 60c. per ton for Mesabi (steam-shovel) ores, and about $1.50 for all others, a weighted average of about 87c. per ton. The ore carries about 52% Fe (natural) or a cost of 1.67c. per unit. Transportation to Pittsburgh costs about 0.66c. per ton-mile on 228 miles of land haul, and 0.09c. per ton mile on 790 miles of Lake haul, so that we may compute that the total cost of the Lake ores will be:

Item	Per ton	Per unit
Mining	$0.87	$0.0167
Land haul	1.50	0.0289
Lake haul	0.71	0.0137
Total		$0.0593

To this 5.93c. may be added an average bessemer-ore premium of 0.33c. per unit, making a total base value of 6.26c. per unit.

Cuban Ore As a Competitive Factor

When we consider the Cuban ore field, we find potential supplies of a billion or more tons of ore, which, when nodulized, will also carry 52% Fe. The ore is all low-phosphorus, and carries 0.75% Ni. The Ni contents we will omit, except to count them as iron, as nickel is not yet an established premium factor. Then Cuban costs will be:

	Cents per unit
Cost of mining, 27c. per ton (40c. nodulized)	0.75
Nodulizing, $1 per ton	1.89
Sea haul, 1200 miles at 0.09c.	2.04
Land haul to Pittsburgh, 375 miles, at 0.66c	5.09
Total	9.77

On a Lake Superior cost base, Cuban ore would be worth 5.93c. in Pittsburgh, as deduced above, plus 1.34c. extra bessemer premium, or a total of 7.27c. Against this is shown a cost of Cuban ore, laid down in Pittsburgh, of 9.77c., or a total differential of 2.50c. per unit in favor of the Lake ores. The only other field which can figure in billions of tons is Brazil. The ore fields are 380 miles from the sea.

Assuming the Brazilian ore to be 62% bessemer (natural) the factors are, on a Pittsburgh base:

	Cents per unit
Mining, 25c. per ton	0.40
Land haul, 730 miles, at 0.66c	7.77
Sea haul, 5700 miles, at 0.09c	8.27
Total	16.44

Comparing this with the Lake base cost of 5.93c. plus a bessemer differential in favor of Brazil of 1.00, leaves a net differential at Pittsburgh, of 9.51 in favor of the Lake mines.

There is bound to be a point where Lake ore and Cuban meet on even terms. This is expressed in terms of land haul, east of Pittsburgh, where higher freight on Lake and lower freight on Cuban bring them to equality. This works out at 100 miles. East of this point, Cuban ores have the advantage, and should establish predominance. On the same basis of calculation, Brazil cannot compute at any point in the United States.

If ores come in at lower freight rates from foreign parts, the question becomes one of transportation competition. The question of tariff also comes in, which moves the competing point about 18 miles still further east. Initial plant cost also enters, but this should be in favor of the Lake ores, as the excess cost of nodulizing plant per annual-ton enters. Therefore it seems that the price of Lake Superior ore and consequently its value, is determined by internal competition, and not by external, and it seems likely that with increased domestic demand, the prices, and consequently the value, will crowd more and more closely to the level allowed by grand-scale competition from foreign fields.

As a result of calculations made from the above considerations, Mr. Finlay believes his 1911 figures were not far off, and that the logic of the situation points to a price of $4.50 to $5 per ton for Old Range bessemer at Cleveland.

Discussion

There was some animated discussion of Mr. Finlay's paper, though the discussion seemed to arise from the application of his principles as a basis for taxation rather than from the paper itself.

Harrison Souder stated that it was his opinion that each property must be considered as a separate proposition, and that the attempt to lump all the mines in a field in one big item was foolish. Some mines were deeper than others, and require more expensive machinery, and have higher mining costs. Also, that while Mr. Finlay said "taxes didn't count," nevertheless they had to be paid, and certainly entered into mining costs. Mr. Finlay had intimated that prices of ore were going up [This part of the paper not abstracted.—Editor.], but 40 years' experience had shown a generally decreasing return. When it came to applying Mr. Finlay's ideas to taxation, it proved discouraging to industry. If a man put down a diamond-drill hole and discovered ore, he was immediately taxed on his new ore. The tendency then, was to promote bad mining, to encourage hand-to-mouth working, and to let the future take care of itself.

R. Van A. Norris also spoke on the taxation question, as it had arisen in Pennsylvania. The state law requires taxation on sale value after fair public notice, but what fair public notice is, and what sale value is, are such complex questions that the 1907 tax assessment is still in the courts. From the standpoint of mining and conservation alike, the assessment of a tax on coal in the ground was an error. Such a tax is simply an invitation to mine the thick seams as rapidly as possible, and to let thin seams go, leaving the ground, probably, so that they never could be recovered. It was his impression that for the good of all concerned, the just way was to levy a tax on the basis of the previous year's output, a fixed and readily determined quantity. This gave a sure basis of taxation, encouraged mine development, and allowed the mining of thin seams as they should be mined.

This reminded another member of a somewhat similar case. Several years ago, the state of Florida, looking for new methods of raising money, levied a tax on standing timber. The result was that it was all cut as fast as possible, and there is no private standing timber left.

Another member added that Pennsylvania itself had recognized the fallacy of this method of taxation, when it came to its forests, and placed any private forests from which no cutting was going on, under state supervision, remitting all taxes until such time as the owners wished to begin cutting again.

It seemed to be the general idea of the meeting that here was a matter demanding much more thought than had been given it, and much more than the views of one man, and one so vital to the mining industry that it should be thoroughly investigated by the Institute.

THE MINING INDEX

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six fo $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

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21,580—COMPRESSED-AIR MINING LOCOMOTIVES and Compressor for Charging. (Engineering, Feb. 7, 1913; 1 p., illus.) 40c.

21,581—DRILLS—Improvements in Rock Drills and Drill Sharpeners. P. B. McDonald. (Min. and Eng. Wld., Jan. 11, 1913; 2⅓ pp., illus.) 20c.

21,582—ELECTRIC POWER—Application of Electric Power to Mining Work. C. A. Tupper. (Iron Tr. Rev., Jan. 2, 1913; 4¾ pp., illus.) Recent developments in the use of high-speed air compressors and synchronous motors on the Lake Superior ranges. 60c.

21,583—FEED-WATER HEATER—Simple Feed-Water Heater Used at Rio Plata Mill. Alvin R. Kenner. (Eng. and Min. Journ., Feb. 8, 1913; 1 p., illus.)

21,584—GASOLINE LOCOMOTIVES—Ore Haulage with Gasoline Locomotives by the Trojan Mining Co. Jesse Simmons. (Pahasapa Quart., Feb., 1913; 4 pp., illus.)

21,585—HOISTING ENGINES—Neuere Arten elektrischer Fördermaschinen mit Drehstromantrieb. Masling. (Glückauf, Dec. 7, 1912; 10½ pp., illus.) New types of electric hoisting engines driven by three-phase motors. 40c.

21,586—HOISTING ENGINES—The Braking of High-Speed Winding Engines. G. K. Chambers. (Journ. South African Inst. of Engrs., Dec., 1912, and Jan., 1913; 11¼ pp., illus.)

21,587—PUMPS—Centrifugal Pump Specifications. Charles A. Carpenter. (Eng. Mag., Dec., 1912; 3 pp.) 40c.

SAMPLING AND ASSAYING

21,588—ARSENIC IN PYRITES—Die Arsenbestimmung in Kiesen. Schürmann und Böttcher. (Chem.-Ztg., Jan. 11, 1913; 2½ pp.) Determination of arsenic in pyrites. 40c.

21,589—RAPID METHODS of Technical Analysis. Frank D. Aller. (Colo. School of Mines Mag., Jan., 1913; 5½ pp.) Continuation of article previously indexed. 40c.

21,590—WATER ANALYSIS—Die Verwendung von Kaliumpalmitat bei der Wasseranalyse. Blacher, Grünberg u. Kissa. (Chem. Ztg., Jan. 14, 1913; 1½ pp.) The use of potassium palmitate in water analysis. 20c.

INDUSTRIAL CHEMISTRY

21,591—LEAD POISONING in Potteries, Tile Works and Porcelain Enameled Ware Factories. (Dept. of Commerce and Labor, Industrial Accidents and Hygiene Series, No. 1, Aug. 7, 1912; 95 pp.)

21,592—SULPHURIC ACID—The Falding Sulphuric-Acid Chamber. (Eng. and Min. Journ., Feb. 8, 1913; 1¾ pp., illus.) 20c.

MISCELLANEOUS

21,593—CENTRAL WATER-WORKS SYSTEM of the Tennessee Coal, Iron & Railroad Company. Morris Knowles. (Eng. Rec., Nov. 23 and 30, 1912; 7 pp., illus.) 40c.

21,594—CHIMNEYS—Calculations for Stability of Chimneys. Leonard Goodday. (Can. Engr., Jan. 16, 1913; 1¾ pp., illus.) 20c.

21,595—FOREST FIRES—Methods and Apparatus for the Prevention and Control of Forest Fires. Daniel W. Adams. (U. S. Dept. of Agriculture, Forest Service, Bull. 113, 1912; 28 pp., illus.)

21,596—FOREST FIRES: Their Causes, Extent and Effects, with a Summary of Recorded Destruction and Loss. Fred G. Plummer. (U. S. Dept. of Agriculture, Forest Service, Bull. 117, 1912; 35 pp., illus.)

21,597—HYDROELECTRIC POWER—The Generation and Transmission of Hydroelectric Power. E. A. Lof. (Eng. Mag., Jan., 1913; 20 pp., illus.) First of a series of six articles covering the equipment and installation of a modern hydroelectric generating station. 40c.

21,598—MOTOR TRUCKS—Motor Transportation as an Aid to Industrial Economy. Rollin W. Hutchinson, Jr. (Eng. Mag., Jan., 1913; 21 pp., illus.) 40c.

21,599 — POWER-PLANT ECONOMICS — I. Horace W. Flashman. (School of Mines Quart., Nov., 1912; 23 pp.) 60c.

21,600—STONE CRUSHING and Screening, Fairmont, Ill. K. E. Casparis. (Eng. News, Jan. 16, 1913; 4½ pp., illus.) 20c

CORRESPONDENCE AND DISCUSSION

Mining in Porto Rico

In the interest of legitimate mining, I ask you to publish the following warning to the mining public:

At present there are several grafting outfits operating in Porto Rico, to the detriment of the honest miner and the industry in general, theirs is purely a stock-jobbing game.

I ask the mining and investing public at least to investigate before they invest. There are many good prospects in Porto Rico, but none of them are on the market now.

M. L. MURRAY.

San Juan, Porto Rico, Jan. 28, 1913.

❋

Amending Mining Laws

Mining congresses and technical associations seem unanimously inclined to lift the prospectors' burden, but the programs seem invariably laid out to hear from and about everybody except the prospector himself. The following are some suggestions, based on 25 years of actual work in the field, for the betterment of the prospectors' condition:

The prospector should be entitled to his find wherever he makes it. Whether it be on railroad, timber, or any granted lands, his claim should be in full effect and he should enjoy all rights his mining claim grants him on government lands. If it be on agricultural land, he should be joint owner with the agricultural claimant, and if the agricultural claimant does not desire such ownership, the discoverer shall have a certain period of lease with option to buy at twice the assessed value of the land, sufficient land to work the mine. As to land that, geographically speaking, may carry mineral, but with no mineral outcrop, 1500x1500-ft. locations should be allowed, with perpendicular claim lines. A certain time to prospect should be given in which a certain amount of annual work should be done or the land forforfeited.

At this age, some difference should be made in the laws covering base-ore locations and the gold-silver ores: taking copper as an instance, it is a hard problem for a prospector to do his annual work upon a group of claims when he must wait for a buyer. This may mean years of holding on, because he cannot sell as readily as he could 20 years ago. There are no one-claim buyers in the market to relieve a prospector—he cannot peddle a copper claim for a few hundred or a thousand—it's a group or nothing, he gets his price or nothing, and it may mean years of waiting, during which he must have from three to 20 claims.

No matter if he has millions of possible tonnage of 2% ore, he must wait for the buyer, and that buyer is not in a hurry since 1907. Before that there were a few people who acted independently and bought. I know of less than a few now, so the one-claim age is a thing of the past. I believe, on such claims, the assessment should be eased up some, making four claims the equal of one, or $25 per claim. This is not comparable with the placer-claim law, which allows eight persons to hold 160 acres for $100 annual work, and one man 20 acres for $100 annual work.

On gold and silver ores, one or two claims will sell, and an assessment of $100 annually is not too much, as there is a market for the product and there is a chance of the work being self-sustaining. I do not believe it is wise to grant patents and do away entirely with annual work. All claims should be worked, even after patenting. I believe in a patent or a certain grant of right, with diminished liability, as to annual work, after a man has followed out our present system of locating and done annual work to the amount of $500 per claim. When this amount has been done and he can show mineral, whether in paying quantities or not, he should be given his grant of right for the sum of $2.50 per acre, and the Deputy U. S. Mineral Surveyor should be obliged to establish his course and lines and file record of same at no further expense to the claim holder other than his payment of $2.50 per acre, or $50 per claim. This grant of right establishes his lines and his undisputed right to those lands as long as he complies with the law.

This grant of right should carry with it a certain amount of annual work that should be compulsory, say $25 per claim, or the privilege of paying double the amount into the state and not doing the work. Should the failure to do this annual work, or the payment of twice the amount into the state continue for a period of five years, then the claim should become the property of the state, either to work, sell, or reopen for location. To grant patents for a certain amount of work alone would have a tendency toward monopoly, the dummies used by timber men is a procedure that should never be allowed again, and it is now time for mining men, engineers, prospectors and all concerned to demand the mineral upon all such unworked land held by old patents, with the free right to prospect upon them, excepting nothing but agricultural land, and not that when a vein can be followed into the land, and when that occurs, the right to discovery should be as I have before stated.

Our mining-claim law is sufficient and is all the prospector needs or wants, excepting a greater field, through laws giving him, as I have stated, his find on all lands. This would be most beneficial. In increasing his field of operation, it would make him honest and act for the public good. Every find he makes will be given to the world. As it is now, many an important find is locked in the breast of the prospector because it is upon timber and grant lands.

His grant of right, if he wants it, should be his with no extra expense other than $50 per claim. If we can get laws of this kind, plain and concise, I believe prospectors would support or indorse a proposition to have all states form their mining country into districts and establish district offices, with an inspector of all mining claims. All mining claims should be filed in his office

and all records of work and assessment be filed 30 days after the first of each year.

The duties of the inspector would be the furnishing of titles or abstracts, and 30 days after the first of each year to go into the field and verify a record of work filed in his office, and on any claim found not as represented, he should post a notice, OPEN FOR LOCATION, and the former locators of that claim should not be entitled to locate for a period of one year, in order to stop the system of relocating.

This inspector should be above favoritism, and should such be shown, he should be punished by imprisonment of five years without bail, and to avoid favoritism, he should be chosen from an outside district. A certain percentage of payments of grant of rights, titles and taxes and recording should go for the maintenance of this office.

C. J. FRY.

Hutton, Calif., Jan. 20, 1913

Conservation as Applied in Alaska

The press bureau of the conservationist's has so thoroughly monopolized the press of the States, that the Alaskan conditions are but little known. From a recent trip there, I obtained some knowledge of the existing conditions. It is claimed by Alaskans, that the conservation movement, especially as applied to Alaska coal, is backed and supported financially by the railroads, steel interests, manufacturers and eastern coal companies, especially the latter.

The steel interests do not want competition on the Pacific Coast; the railroads are interested in the freight haulage across the continent; the manufacturers wish to continue to control all markets.

People in the Bering River coal fields, at Katalla, are now paying $21 per ton for an inferior quality of British Columbia coal, 50c. per ton duty, with an unlimited amount of as fine coal as there is in even Pennsylvania, both anthracite and bituminous, within 12 miles of them, of which they are not allowed to take one pound, even for their own use. The Forest Ranger stationed there, collects 25c. per cord for all wood cut, even for domestic purposes, and $1 per M board feet. stumpage for lumber. This is of such poor quality, all spruce, that the two railroads, that commenced to build to the coal fields, and abandoned them after expending over $3,000,000, after testing the native timber there for ties and bridge purposes, decided it was cheaper to ship in from Oregon and Washington.

Over on Cook's Inlet, a Mr. W. several years ago located 40 acres of coal land, so situated on tidewater that the high tides (second highest in the world) mined and transported it, leaving it on the beach. He made a practice for years of gathering this and selling it to the United States revenue cutters. He had complied with the laws in all respects, and applied for patout, several years since. Finally he went to Washington to see about it.

There, by appointment, it is said that he met President Taft, who said to him, "well Mr. W., I suppose you came to see about your coal claims." "Yes, partially, Mr. President." The President then said, "Mr. W., the worst thing we appear to have against you, is that you have been selling stolen property." This rather staggered Mr. W. for a moment, then looking out of the window, he said: "Mr. President, you see that large department store over there?" "Yes." "Suppose for years that the U. S. Government, had knowingly been buying stolen goods from that department store, what would you do in such a case?" The President could not answer, but tapping Mr. W. on the back, said: "Mr. W., that's all right, you go back home to Alaska, you will soon receive your patent." This was months ago, and up to recent date he had heard nothing.

Over in the Bering River field, a Mr. Mac., had some claims, on which he had compiled with the laws, so far as he knew and applied for patent. He had opened up and developed the claims, to the point where he could commence taking out and shipping coal, but because he had not shipped and demonstrated that he had a commercial coal mine, his patent was refused. Naturally, Alaskans do not know where they are at.

Another coal owner, in examination, testified that he had run a 700-ft. tunnel on his claims, and cut three large coal veins. When asked for what purpose he had done this, he answered "to prospect the property," and because he used the word *prospect* instead of *develop,* his application was canceled. When no other reasons are found, applications are rejected because application for patent was not made within a certain time. It is certain that the employees of the government are determined at any event not to grant them, under the present administration, and the $10 per acre which is necessary to accompany the application, is lost, as this cannot be recovered, except by special act of Congress.

There is apparently no relief, except in the change of the present ruling powers of the government. Nearly everyone that can is getting out of Alaska, the boats out being loaded; we met some going to Tahiti and Mexico. Outside of the gold-placer and dredging operations, there is but little doing.

The last Congress pretended to give Alaska home rule, but the act specified that it cannot legislate concerning mineral, coal or agricultural lands, taxes or fisheries. As this covers practically all of their industries, it was only a lemon. Under the present laws the salmon industry will soon be extinct.

The federal government taxes the canneries a specified sum per case canned, but allows them to pay this by presentation of affidavits that they have hatched and released in the waters a certain number of salmon fry; this is a farce, affidavits are cheap. The canneries catch in their traps and nets the greater portion of the salmon as they go up the fresh-water streams to spawn, consequently it will not be long before they become scarce, like the seals.

It seems strange, that we as Americans, who claim to belong to the most intelligent nation, will continue to permit our employees, officials of the government, who are elected by the people, to construe our mineral and land laws as they please, simply by the rulings of the Land Office, from which there is no appeal.

The natural disadvantages of Alaska, to those who know it, would appear to be sufficient, without the government's action to throttle efforts to develop the country. The U. S. navy, with a force of 40 men, in the Bering River coal field, has taken out 855 tons of coal with the view of thoroughly testing the quality for use of the navy.

G. L. SHELDON.

Ely, Nev., Feb. 12, 1913.

EDITORIALS

American Institute of Mining Engineers

The annual meeting of the Institute last week passed very smoothly and accomplished a great deal in consummating the reforms inaugurated during Professor Kemp's hard-working administration. Under Mr. Kirchhoff, and following him Professor Kemp, the Institute has been getting up steam for a new run of usefulness. Mr. Rand takes hold of the throttle with the gage registering 100 lb. He may have to run slowly and carefully for a while, but he may safely assume that he is about to direct a year's work of peaceful progress, following a year of controversy that made life a burden to Professor Kemp, although, of course, he never will admit it. Yet he and everybody else knows that it was just the spirit of fight that reawakened the Institute and prepared it for the future usefulness that may be reasonably expected of it.

After this year of controversy we find that the following things of first-class importance have been accomplished:

(1) The destruction and disappearance of all ideas about raising the annual dues.

(2) The raising of a fund that insures the liquidation of the land indebtedness, achieved by Doctor Douglas, with the coöperation of Mr. Rand, but mostly by Doctor Douglas.

(3) The reëstablishment of the finances of the Institute upon a sound basis, largely Mr. Rand's work.

(4) The adoption of a new constitution, which above everything else abolishes the old system of dual government of the Institute (which was found to be no responsible government at all), and the provision of means to put the affairs of the Institute under the control of its own members, two essential reforms that were first pointed out and urged by the JOURNAL.

(5) The election of a new secretary, who is a metallurgical engineer of high distinction, an accomplished writer and the possessor of a scholarly mind, against whom there cannot be any complaint and to whom loyal coöperation can and should be extended, as undoubtedly it will be.

(6) The development of a plan for the union of the Mining and Metallurgical Society of America with the Institute, which undoubtedly will be consummated before long and will unite the engineers of our profession in thought, enthusiasm and coöperation, removing the breach that heretofore has divided interest, if not loyalty.

In rejuvenating the Institute there is only one thing that we think of that remains to be done; viz., the establishment of an official record in certain matters of Doctor Raymond's administration that have been made the subject of criticism in a more or less indirect way. This should be done in justice to Doctor Raymond, who should be made to know that in spite of innuendoes he stands nevertheless high in the esteem of the members of the American Institute of Mining Engineers, the prestige of which is so largely owed to him; and that the Institute still wants his services. The members of the Institute will be gratified to know that one of the very early acts of the newly constituted board of directors was to elect Doctor Raymond to the position of secretary emeritus, with such duties as may be assigned to him by the president.

❖

Petroleum and Natural Gas

In the last report of the Director of the U. S. Geological Survey it is remarked that the principles governing the origin and mode of occurrence of petroleum and natural gas are as yet but fragmentarily grasped by geologists. Every oil field examined in detail contributes its data for use in the eventual interpretation of the problems, and each pool is studied with keen alertness for the discovery of some key that may aid in the coördination of the data, which sometimes, according to the region and conditions, seem, on account of our lack of knowledge, even to be in conflict. The observations made by the geologists of the U. S. Geological Survey in the oil and gas fields of California and Kentucky promise to further the solution of some of the problems, and by pointing out the relations of oil and gas occurrence to the geologic structure of the regions examined they have rendered important scientific as well as economic aid in oil and gas development; but the basic principles controlling the widely varied modes of occurrence and accounting for the differences in kinds of the oils in widely separated regions are possibly still far from view.

It is gratifying to know that the U. S. Geological Survey is giving attention to this important subject, and that its scientists feel that they are making some useful progress in their studies. It is remarkable that this subject has been so long neglected, not only by the U. S. Geological Survey but also by geologists in general.

The production of both petroleum and natural gas are branches of the mining industry and both are important fuels in mining and metallurgy. Our interest in them is therefore twofold, being both from the productive and consumptive standpoint.

The technology of oil and gas production and distribution are highly developed. The drilling of wells is thoroughly standardized, the ingenuity of the well-drillers in meeting difficulties is so remarkably exercised as to impress the lay minds like feats of legerdemain, the construction of pipelines, pumping machinery and other accessories leaves little to be asked for, but amid all of this we must still rely in general upon the scent and instinct of the wildcatter to find the oil and gas for us, and even after it has been found we know next to nothing respecting their physics and manner of occurrence. We do not know, for example, whether the pressure of natural gas is due to hydrostatic head or to something else; we do not know anything about the saturation and discharge rate of

sandstones of different porosities; we have little or no data that help in predicting the volume and life of a pool; we don't know why some pools yield gas to minus-atmospheric pressure while in others water shuts off wells when their registered pressure is still 300 or 400 lb.; we don't even know whether natural gas in its *locus naturae* is a gas or a liquid.

These are merely specimens of the engaging problems that await geologists in their study of this subject. There are similar problems in connection with petroleum. We do not mean to imply that geologists have made no progress in these directions. We remember the brilliant success of the Illinois geologists. It is just such feats that lead us to expect something more.

❖

Silver

The price of silver has fluctuated slightly, but mainly in a downward direction, and the February average in London will be about 1d. less than in January. The demand for India has been good, and shipments to that country have exceeded those of last year, but not by a large amount. The falling off in the purchases for China, however, has been large. That country needs money badly, but its wants are still unsatisfied, owing to the many difficulties which have attended the negotiation of the so called "Six-power loan." The closing of that loan is still in the air, the latest delay being due to objections interposed by the French government to certain details of the agreement. Should the loan be actually concluded, there would be a heavy demand for silver, and probably at least a temporary advance in price; but the time for this is still uncertain.

Meantime, the stocks of silver in hand are large and there is plenty to meet any present demand. The Indian government has accumulated enough in its currency reserve to supply its requirements for some time. Unsold stocks in private hands are large, Shanghai reporting this week a total of £4,490,000, and Bombay £1,750,000; while the stocks in London are large.

The new outbreak in Mexico may interfere with the supply of silver. Up to the present time there has been less interference with shipments of silver than might have been expected, but no one knows what the next day may bring forth in that unsettled and turbulent country.

❖

Unnecessary Mine Fatalities

On Jan. 25, in the Pittsmont mine, Butte, Mont., one man was killed and two others severely injured by failure to escape from the explosion of a 19-hole blast near the shaft station. The men had given the hoisting signal and had spitted the fuses. The engine lifted the cage a few inches and then dropped it back to the station.

At the coroner's inquest the engineer testified that he did not have sufficient air. He answered the blasting signal, but the engine would not work There was no gage on the engine. One man testified that he escaped the blast by climbing up the shaft timbers. As reported in the local newspapers, nothing was brought out at the inquest with respect to the existence or non-existence of a ladder-way in the shaft. Apparently, there was none. A few weeks ago a precisely similar accident occurred in the Imperial mine in the Joplin district, Missouri, resulting in the death of three men.

We have not heard about the verdict of the coroner's jury in the Joplin accident. The Butte jury reported that death occurred because the engine would not work. Such verdicts are feeble evasions of the real question of responsibility. The latter would be fixed by a verdict that death occurred because no escapement ladder was provided.

Isn't it criminal negligence, callousness, thoughtlessness, or whatever hard name anybody may choose to call it, that men are put to work underground, subject to such known hazards as fires, floods, blasts and others that are constantly materializing, without any means of getting out except by a single shaft and a single hoisting engine, which may fail to work at a critical time, as happened twice in January last in instances that we know of because loss of life resulted?

Yet neither the State mining laws of Missouri or Montana contain provisions that shafts must be provided with ladderways.

Two of the men who escaped death in the Pittsmont accident, but suffered severe injury, have sued the company for damages, claiming that they were caught in a trap with no means of exit. Undoubtedly they were.

❖

Discussions at the A. I. M. E. Meetings

To the disinterested observer, one of the features of the meetings of the A. I. M. E., as contrasted with the meetings of the English societies, is in the apparent less careful preparation of the discussion. Judging from the last meeting, where man after man who was called upon for discussion declined to speak, because he had either not seen the paper read, until a few minutes before the meeting, or had not seen it at all, this seems to be due in large measure to the fact that the papers are not prepared sufficiently long beforehand, or are not given a quick enough distribution.

It is to be hoped that the new administration of the Institute will bend some of its energies toward getting the papers submitted more promptly and to getting them printed in time to distribute to the members before the meetings. We can think of no way which will give better results toward making the Institute an active factor in metallurgical and mining progress than real, live discussion at the meetings.

❖

The difference between a free market and a "pegged" market is that in the one case buyers and sellers are willing to trade, just as they do in horses, houses, etc. In the other case, the seller declares, "I have got something that consumers must have, and no matter how much of it I've got, they must pay the price I demand." This point may be carried if there be such a monopoly as exists in the nickel business, but in the big branches of the metal business there is fortunately sufficient free competition to confuse any such plan as the thrice-repeated experience of the Amalgamated interests in the copper business, and the historic experience of Judge Gary in the steel business have amply proved. The copper market is now undoubtedly a free market. So is the lead market. The spelter market has always been so.

BY THE WAY

A recently graduated engineer succeeded in producing a melancholy atmosphere about the old fireside by writing home from the West that he was working on the "graveyard" shift at the Dead Man mine, in the Funeral Mountains, near Death Valley.

⁂

The article by Morris J. Elsing on "Relation of Outcrops to Ore at Cananea," published in the JOURNAL of Feb. 15, 1913, was read by Mr. Elsing before the Phelps-Dodge Geologic Conference, Dec. 21-26, 1912. A footnote to this effect was inadvertently omitted.

⁂

The Boston *News Bureau* says that the cheapening of radium, now $3,000,000 a pound, is believed possible through the discovery of ore in Cornwall, Eng., which will permit production of metal on a commercial scale. In this case it would be well to define what is considered to be "a commercial scale."

⁂

The will of the late John Fritz disposed of an estate of $700,000. After leaving his relatives $300,000 and faithful empolyees $63,000, he bequeathed large sums to various educational institutions, including $150,000 to Lehigh University, $21,000 to Temple College, Philadelphia, and $21,000 to American University, Washington, D. C. He also left $21,000 to the Methodist Hospital in Philadelphia.

⁂

Two bars of refined gold, valued at $50,000, were sunk in San Francisco Bay on Feb. 14, as a result of the collision between the Southern Pacific steamer "Seminole" and the freight steamer "Corcoran." The gold was on the "Corcoran" and was in transit from the smeltery of the Selby Smelting & Lead Co., to the U. S. Mint in San Francisco. The steamers collided during a thick fog between Alcatraz and Angels Islands, and the "Corcoran," which carried a cargo of 600 tons of sugar and some lead piled fore and aft of the safe containing the gold bars, pitched bow down, turned over and drifted, spilling the cargo and presumably the safe near the place of the collision, the steamer sinking off Meigs wharf, San Francisco. The "Seminole" sank near the place of collision. Up to Feb. 19, divers had failed to find the safe in the wreck. Here would seem to be a great opportunity for operators of Spanish needles, "dowsing rods," and goldometers. Still we think this gold will be recovered in the usual fashion, if at all.

⁂

With the application of psychic forces to mining, we may expect some marvelous achievements that are now beyond the powers of the ordinary miner who depends upon brute force. A writer to the *Times* tells of attending a lecture by Benjamin Fay Mills, who recounted a remarkable story illustrating how a man might eventually move mountains by faith—no steam shovel or deferred stripping accounts required. Mr. Mills incidentally was unfolding a theory of psychology under the caption of "The Psychic Powers of Man." "Strange faiths are abroad in the world," the writer comments, "and I was not so much surprised at the wildness of Mr. Mills' theory as I was at the avidity with which the gathering of apparently intelligent men and women seized upon it. The address was made up of a smattering of the Bible, Emerson, Professor James, Frederic Myers, Christian Science, hypnotism, and some stories gathered from the four winds. As a proof of his belief that by faith a man could move mountains, Mr. Mills cited the following: 'A workman was caught between the wheels of an immense stone crusher, which appeared about to mash him to a jelly, but the man, by means of the tremendous power of his will, gathered together within his frame such force that he was able to shatter the vast instrument of steel." Paraphrasing the words of Horatio: "There needs (a) ghost come from the grave to tell us this" ere we will believe it.

⁂

By means of the new equity rules, which have the force and effect of law, the judges of the Federal District Court have created the position of "assessor" to aid in the trial of patent cases. This is following the practice of the German courts, which in proceedings of a technical nature, such as patent suits, employ "triers" or "supervisory experts" to pass upon the technical evidence. The new rule authorizing the use of assessors, reads as follows: "In the trial of a patent cause, whenever in the opinion of the Court the cause involves intricate technical or scientific questions of fact, the Court will, upon the consent of all parties, appoint some disinterested person skilled in the art to act as assessor, the reasonable fee for whose services shall be a part of the taxable disbursements and enforceable as is a master's fee. Such assessor shall sit with the judge at the hearing of the evidence, and shall assist the Court in its deliberations upon the cause in such manner as the trial judge may request, and any written opinion rendered by the assessor at the request of the judge shall be a portion of the record on appeal."

⁂

A personal-injury suit was recently brought in Joplin, Mo., by J. L. Masters against the Rice & Chapman Mining Co. for $300 damages for the loss of two fingers which were cut off by a loaded can of "dirt" that dropped when the friction on the hoist failed to act as the can was being pulled away. The can dropped a short distance and Masters who lost two fingers alleges negligence on the part of the hoistman. The hoistman declared that the hoist was in normal working order and that the slip was not through any fault or failure on his part. He said: "That's one thing that a friction hoist will do once in a while; it will slip, and I know of no way to prevent it. I have been a hoistman for 23 years, using friction hoists a greater part of the time, and never had an accident or anyone get hurt in all that time." Failing to prove negligence on the part of the hoistman as alleged, the plaintiff's attorney claimed damages on the ground that if friction hoists were known to slip, they are dangerous and ought not to be used. The defense was that the plaintiff was guilty of contributory negligence in placing his hand on the empty can before the loaded can had fairly started and that the common use of friction hoists barred the responsibility for damages because the chance of a slip was universally known among the miners.

The Federal Suit

Sidney Norman, one of the plaintiffs in the suit brought by minority stockholders of the Federal Mining & Smelting Co., to have set aside the smelting contract between the two companies, has issued a circular letter to the Federal stockholders, informing them of the action, and inviting them to become parties to the suit.

This suit hinges upon the ore-smelting contract, which is claimed to be unfair, especially the basis of payment for the lead contents of the ore. The mining company is paid for 90% of the lead contents at 90% of the New York price, so long as lead sells at $4.10 per 100 lb., or less, at New York. When the price is above $4.10 the smelting and mining companies share the difference between $4.10 and the market. The mining company is charged $8 per ton for smelting, plus freight based upon the rate from Wallace, Ida., to Pueblo or Denver, Colo. (about $7.15 per ton), but the smelting company reserves the right to divert shipments elsewhere.

It is alleged that under some contracts granted by the smelting company to other producers in the same district, settlement for lead is made at the full New York quotation, with a smelting charge of $8 per ton and a freight rate of $6 per ton.

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The Banquet of the Institute

Members of the American Institute of Mining Engineers met at the Waldorf-Astoria Hotel on the evening of Wednesday, Feb. 19, for a dinner in honor of the retiring president, Prof. J. F. Kemp, and the newly elected president, Charles F. Rand. About 140 guests were present. Previous to the dinner, Professor and Mrs. Kemp and Mr. and Mrs. Rand received, and a half-hour was spent in general conversation. The dinner began soon after seven o'clock.

Following the dinner, Professor Kemp made some remarks, reviewing the history of the Institute during 1912 and introduced Mr. Rand. Upon this introduction all the members present arose and waved American flags and cheered enthusiastically. Mr. Rand delivered a brief address in a felicitous way. Professor Kemp then introduced W. L. Saunders as toastmaster, and a very good toastmaster was he. Mr. Saunders never failed in this or in any other undertaking.

The guests of the Institute at the dinner were Dr. A. E. Barlow, president of the Canadian Mining Institute; Dr. H. M. Chance, president of the Mining and Metallurgical Society of America, and Charles Warren Hunt, secretary of the American Society of Civil Engineers. These gentlemen were called upon and respectively made interesting and appropriate addresses. Miss Inez Milholland spoke of the woman's suffrage movement. Doctor Douglas described the raising of the money required to liquidate the land fund. He sent out about 10,000 letters and received about 400 replies; wherefore he characterized his correspondence as being rather one-sided, but nevertheless the desired result was accomplished. Doctor Douglas spoke very strongly about the objections to raising the dues of the Institute (a project which is now, no doubt, buried forever). Doctor Douglas was enthusiastically cheered (surely the Institute ought to do something substantial to testify its recognition of the services of this grand old man, who has never failed it).

Mr. Riordan responded to the toast of "The Ladies," and made one of the hits of the evening. He recited, or sang (or perhaps we should say both), some verses, which in his modesty he attributed to Mr. Saunders, but except for purposes of his own he had no reason to disclaim their authorship, inasmuch as they were very good verses.

Philip N. Moore spoke in a highly interesting way of the trials and tribulations of the chairman of a nominating committee. He remarked that a year ago the slate of the nominating committee received about 25% of the votes cast. This year the official ticket received about 35%. Consequently, he hoped, in view of this progress, that in the course of a few years the ticket of the nominating committee might receive a majority of the votes cast.

The meeting broke up about midnight. It was a genial and friendly affair, which did much to promote good feeling in the Institute.

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Changes in Excise Tax on Profits from Mining

WASHINGTON CORRESPONDENCE

After lengthy inquiry, Commissioner Cabell has issued the following statement of changes in the rules applying the corporation tax to mining companies:

There have been several inquiries as to the application of the regulations relative to an allowance for an unearned increment in the ascertainment of net income of mining corporations for the special excise tax on corporations, which indicate that the true intent of the regulations is not understood. The fact has also developed that many corporations, in their attempt to apply the regulations, begin with a current unit valuation of the product concerned instead of the en bloc value as of Jan. 1, 1909, as is required. The manner of entering the ascertained valuation as of record has also been neglected and misunderstood.

In order to make the requirements of this office plainer and to assist corporations in arriving at valuations which shall not be speculative in character nor founded upon the future profits and earnings of the corporations which should belong to the period during which they are earned, and in order that no portion of income which really belongs to any particular year shall be ascribed to or allotted as the earnings of previous years, items Nos. 99, 100, 101 and 103 of T. D. No. 1742 are modified so as to read as follows:

No. 99. The note is amended so that it shall read: Note—Values, as aforesaid, should not be estimated on the basis of the assumed salable value of the output under current operative conditions, less the actual cost of production, because, as hereinbefore stated, the selling price, under such conditions comprehends a profit both for carrying the investment in coals, etc., improvements and working capital, and for conducting operations in respect of production and disposal of product. The value to be determined as stated must be en bloc of the entire deposit of minerals and mineralized property owned, exclusive of improvements and development work, if the same were disposed of in that form.

No. 100 is amended to read: The unit value as of Jan. 1, 1909, ascertained as above outlined, would indicate the value to be attached at that date to the capital assets disposed of during any calendar year succeeding. The amount claimed as a deduction from gross income on account of unearned increment shall be shown separately in the deductions from gross income in the return of annual net income.

No. 101 is amended to read: The precise detailed manner in which the estimate of value of minerals, etc., as at Jan. 1, 1909, shall be formed, must naturally be determined by each corporation interested. Every corporation claiming and making a deduction for unearned increment as provided in Sec. 100 preceding, shall maintain an official book record of the properties owned by it in connection with which unearned increment is claimed, and which record shall show the general ledger or general balance sheet value thereof, together with the estimated amount of appreciated value in such properties in excess of general balance sheet values, as of Jan. 1, 1909, together with all evidence and information

on basis of which such appreciated value was formed. This estimate must be formed on the lines and basis indicated in the note, Sec. 99, namely, the salable value of the entire deposit considered en bloc. This record should also present clearly and fully the transactions during each year in respect of quantities of minerals disposed of and for which deductions are made respectively for depreciation and unearned increment, together with the amount thereof. No deduction for unearned increment will be allowed unless the aforesaid record is kept, nor unless the evidence as to the estimates of quantity of minerals in deposit and the valuation thereof are accepted by the department. Values determined and recorded as of Jan. 1, 1909, as as aforesaid, should be used in the compilation of all subsequent years' excise tax returns.

In case it subsequently develops the property possesses a greater quantity of mineral, etc., reserve than was in the aggregate estimated as of Jan. 1, 1909, only such an amount of aggregate value can be assigned to such excess mineral tonnage as of Jan. 1, 1909, as it was at said date estimated by the company attached to the property and was not assigned by it, as hereinbefore provided, to the specified tonnage in the property.

No. 103 is amended to read: As the amount to be deducted for depletion of deposits (Regulation No. 101) is to be formed on basis of the estimated reserve of minerals, etc., it follows that if it develops such estimate is understated, the cost investment and estimated unearned increment in the capital asset may be wholly extinguished before all mineral reserves are removed. When this is reached, further deductions for exhaustion of minerals should be discontinued. Collectors of internal revenue will make requisition for the necessary number of these amendments and furnish a copy to each corporation interested.

The Wisconsin Iron Discovery

Mention was made in the JOURNAL for Feb. 15 of a newly reported discovery of iron ore in southwestern Wisconsin. Inquiry from W. O. Hotchkiss, state geologist of Wisconsin, revealed the following information:

The district, which lies in Vernon and Crawford counties, was very thoroughly covered by the former geological survey of Wisconsin in 1873, and the deposits were explored in many different localities at several periods from 1840 on. So far as known they are derived from the oxidation of pyrite in more or less heavily pyritic beds near the top of the Potsdam sandstone. While the surface extent is sometimes quite large, the thickness is not known to be more than a few feet, except in isolated small areas, where reports of as much as 40 ft. have sometimes been made; these reports, however, are no more than gossip, not the result of reliable work, and not accompanied by assays. It is reported that one of the large companies operating in the Lake Superior district is now planning to carry on some drilling operations, to determine the character and extent of these ores.

While it is probable that there are many deposits that will contain moderate amounts of ore, it is not probable that the recent extravagant reports in the daily press are anywhere near the truth. Everyone who has tried to develop this region in the past has given it up, but it is possible that under present conditions a strong company may be able to make a small production of ore.

Societe Industrielle du Radium

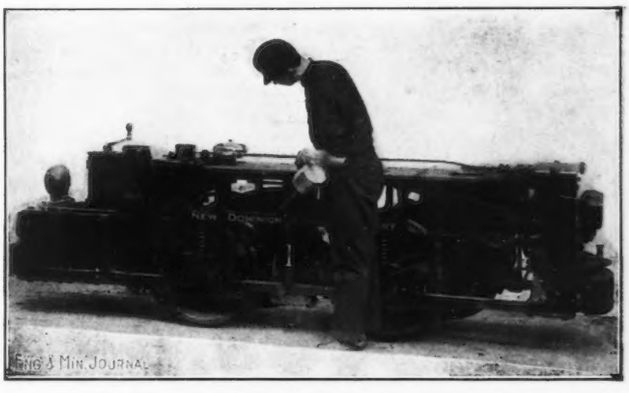
The formation of La Société l'Industrielle du Radium (capital, £2,000,000) to acquire the South Terras mine, near Grampound Road in Cornwall, is noted in *Echo des Mines*. This is or was an iron-tin mine. The ore is said to run 6 to 7 mg. per ton in radium, and on the lowest levels as high as 190 mg. Ra per ton of ore.

The company will build a works at Coupières, department of Siene-et-Oise, to treat 500 to 600 tons of ore per month. The French directors are: Prof. Jacques Danne, of the radium laboratory of Gif (Seine-et-Oise); Dr. J. Laboure, of Amiens; Dr. E. Guyenot, of Aux-les-Bains, and Dr. Paul Giraud, of Chantilly.

Baldwin-Westinghouse Mine Locomotive

The features of a new type of mine locomotive, recently placed on the market by the Baldwin Locomotive Works and the Westinghouse Electric & Manufacturing Co. are the open cast-steel-bar frame and the specially designed commutating-pole mine motors.

The frame is designed to give maximum strength and to allow ready access to all parts of the locomotive for inspection and overhauling. The upper parts of the motor and armature-bearing housing can be removed without disturbing the suspension, so that each part of the motor is exposed for inspection. To remove the grid resistors, it is only necessary to take off the locomotive covers and



OPEN-FRAME MINE LOCOMOTIVE

loosen the bolts and terminals that hold the resistor frames in place. The open frame also gives much better ventilation to the motors and resistance than that obtained by armor-plate construction.

Another interesting feature introduced on locomotives with outside frames is the Vauclain removable gib. To remove a journal box with this gib, the binder is dropped and the weight taken off the journal box; the journal box is then slipped out. On locomotives with inside frames, the journal-box cellars are arranged to be easily dropped out for repacking. A set of wheels and axle may be taken out without disturbing the motor suspension or connections, by blocking the motors in place and removing the binders.

The motors make use of commutating poles by means of which excellent commutation is obtained, thereby increasing the reliability of operation and cutting down maintenance cost. The life of the insulation of armature and field coils is increased because of the absence of copper and carbon dust. The armature coils are form wound and are made moisture proof by means of an impregnating compound. The field coils are impregnated and protected from vibration by heavy cushion springs placed between them and the motor frame. The armature core is mounted on a spider, to which it is keyed, making it possible to remove the shaft without disturbing the windings, and also reinforcing the shaft against bending. Large openings are provided in the spider and core for ventilation.

PERSONALS

Stanley Low is in St. Petersburg on a business trip.

E. D. McDermott is manager of the Tanalyk copper mines in Russia.

R. E. Smith is operating placer drills near Nikelaevsk, East Siberia.

A. B. Frenzel was at Idaho Springs, Colo., recently, on professional business.

Ross Browne Hoffman is in the Oodeel Lake region on the Lower Amur, East Siberia.

Dwight E. Woodbridge, of Duluth, Minn., is in northern Sonora, on mine-examination business.

J. P. Hutchins has returned to St. Petersburg from London. He is consulting engineer to the Cabinet of the Czar of Russia.

O. B. Hart, who has been building Natomas No. 7 dredge at Folsom, Calif., has retired from that work, in order to go to South Africa.

E. L. Talbot, superintendent of the Daly West, has been engaged as general manager for the Thompson-Quincy property, in Summit County, Utah.

J. E. Dailey, chief civil engineer of the Brier Hill Steel Co., Youngstown, Ohio, has been promoted to the position of assistant to Barton R. Shover, general superintendent.

D. W. Buckby, for some time past in charge of experimental work for the Federal Mining & Smelting Co., has been appointed superintendent of the Stewart Mill at Wallace, Idaho.

Walter Harvey Weed was at Cananea, Sonora, Mexico, last week. He leaves there Feb. 28, going to Douglas and Globe, Ariz., and Wardner, Idaho, returning to New York about the middle of March.

A. G. Suydam has resigned the position of general superintendent of the Revenue Tunnel Mines Co., at Boulder, Colo., to accept that of metallurgist of the Ohio Copper Mining Co., at Lake, Utah.

James F. Thompson, division superintendent of the Colorado Fuel & Iron Co., Trinidad, Colo., has resigned to take a position with the Albuquerque-Cerillos Coal Mining Co., with headquarters at Albuquerque, New Mexico.

Paul E. Morse, of the Yuba Construction Co., has gone to Folsom, Calif., to finish Natomas No. 7 dredge, which he expects to complete early in May, after which he will go to Hammonton, in the Yuba field, to build No. 14.

E. Hibbert, superintendent of mines for the British Columbia Copper Co., has resigned to fill a position at Sudbury, Ont. He has been succeeded by F. S. Norcross. J. J. Jones has been appointed superintendent of the Mother Lode and C. Hallerstadt foreman.

C. M. Eye has resigned the management of the Concheno mines of Corrigan, McKinney & Co., in Chihuahua, Mexico. owing to the unsatisfactory conditions existing in that state. He will shortly return to California, where his temporary address will be Box. 571, Ocean Park, Los Angeles County.

John Bancroft and J. H. Whiteman, of Wilmington, Del., and C. A. Higbee, of Philadelphia, were recently in San Francisco, returning from a visit to the properties of the Nevada-Wonder and Tonopah mining companies, with which they are officially connected. They contemplate a tour of California before returning to the East.

OBITUARY

George W. Ham, president of the Idaho-Maryland Development Co., operating a gold mine near Grass Valley, California, died at Rochester, N. Y., on Jan. 21. He had recently sold his interest in the company.

Mexican dispatches of Feb. 24 report that in the territory of Tepic an American, Boris Garow, consulting engineer of a mine, was killed in an attack by rebels on the town of Neuva Buena Vista Feb. 22. Ramon Garzueta, a Mexican, was also killed.

Richard J. Walker died at Philadelphia, Feb. 15. He was born at Rome, N. Y., but as a boy went to Pennsylvania, living for many years in Venango County. He was prominent in the oil country for many years as an engineer and manager. He was long superintendent of the Bradford Oil Co., and was interested in other enterprises.

Frank Douglas Stewart, mining engineer, was killed recently in an explosion in a mine at Bicknell, Ind. His helper, William Pryor, was killed at the same time. The state mine inspector reports that the explosion was due to the employment of unlicensed men who neglected their duties. Though only 26 years old, Mr. Stewart had made a record for himself as an engineer and also as an earnest worker for the uplifting of miners.

Max Boehmer died at Denver, Colo., Feb. 13, aged 66 years. He was born in Luxemburg, Germany, and graduated from the Hanover Polytechnic School. About 1871 he came to this country and was for several years employed as an engineer in the United States service on the Mississippi and other river improvements. In 1879 he went to Colorado, and settled at Leadville, where he lived for nearly 20 years, being employed as engineer by several of the large mining companies. In 1899 he removed to Denver and took charge of the mining interests of the late David S. Moffatt. He was consulting engineer of the Iron-Silver Mining Co., at Leadville, the Portland Gold Mining Co., at Cripple Creek, and of other mining companies in Colorado, Nevada and Idaho. He was a frequent contributor to the columns of the "Journal." His death was the result of injuries from a fall while examining the Bunker Hill mine in Idaho recently.

SOCIETIES

Sociedad Quimica Argentina—This society has been formed, with headquarters at Buenos Aires, to advance the study of chemistry in Argentina, to protect professional interests and publish yearly volumes of proceedings and papers by members. Enrique Herrero-Ducloux is president. M. Leguizanion Pondal, secretary.

American Institute of Consulting Engineers—A meeting of the Institute for the purpose of further discussing "Professional Relations" will be held at the Engineers' Club, New York. The discussions of L. B. Stillwell and S. Whinery at the last meeting were printed in "Engineering News" of Jan. 23, and it is hoped that the members will read these articles, and come prepared to speak. There will be an informal dinner at 6:30 p.m. at the same place just before the meeting on Mar. 11.

INDUSTRIAL NEWS

The H. W. Johns-Manville Co. has removed its Newark office to 239 Halsey street.

The Hardinge Conical Mill Co. has opened a London office at 563 Salisbury House, London Wall.

Allis-Chalmers Co. is to supply the Cia. Minera Beneficiadora de Tal Tal, Santiago, Chile, with equipment for a cyanide plant, and the Commonwealth Mining & Milling Co., Pearce, Ariz., with machinery for a 30-stamp mill and cyanide plant.

Traylor Engineering & Manufacturing Co., 26 Church St., New York, has received an order for three more sets of rolls from the Miami Copper Co. This will make a total of 20 sets furnished this company. The rolls are all equipped for automatic lateral adjustment and have the patent hold-down device for the movable bearing. Orders for additional sets of this type of roll have also been received from the Teziutlán Copper Mining & Smelting Co., La Aurora, Mexico; the Consolidated Mining & Smelting Co., Trail, B. C.; and Frisco Consolidated Mining Co., Needles, Ariz.

Hardinge Conical Mill Co., 50 Church St., New York, recently received instructions from the Copper Range Consolidated Mining Co., Michigan, to increase its order from 23 to 30 Hardinge mills. The Olla de Oro Mining Co., Bolivia, has placed an order for another mill, making a total of two units of one ball and one pebble mill each. These mills are sectionalized to 250 lb. as it is necessary to transport them 125 miles by muleback. The order of the Braden Copper Co. for 16 Hardinge mills has just been completed. Other orders include two Hardinge mills for Butte & Superior Copper Co., Butte, Mont., three for Commonwealth Mining & Milling Co., Pearce, Ariz., and two for Birmingham Ore & Mining Co., Birmingham, Ala.

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Feb. 19

The Snowfall in the High Sierras in the last months of 1912 and the first week of 1913 was greater than for several years past, ranging from 5 to 15 feet in depth. In the Siskiyou mountains the snow in early February was deeper than at any time since 1890. That year and 1860, it is said, are the only years in the mining history of northern California that are comparable to the present in the quantity of snowfall. This indicates that there will be an abundance of water for all mining purposes.

Electric Power at Randsburg will quickly follow the installation of electric lights. The power company will soon be ready to supply the mines and mills in the Randsburg, Stringer and adjoining mining districts. The Randsburg district occupies the greater portion of two townships on the eastern edge of Kern County; the Stringer district lies south and principally within San Bernardino County, which adjoins Kern County on the east. Randsburg is the chief mining and commercial center in eastern Kern and western San Bernardino Counties and though one mile west of the Santa Fé Ry. station of Johannesburg, it is the dominant point. The current is furnished from the San Bernardino power house of the Southern Sierras Power Co., but the towns and the mines will be supplied direct from the power plants in the mountains of Inyo County as soon as the new construction which has been in progress for the last year or more shall be completed. It is expected that practically all the mines in the Randsburg and Stringer districts will install electric power as soon as it is possible. This innovation in mine power will be especially valuable to low-grade producers, which could not be profitably developed by steam or gasoline power. The new stamp mill recently completed by the Consolidated Mines Co., and installed at the Good Hope mine, is provided with a 30-hp. electric motor and is ready to begin dropping stamps, waiting only for the electric power. The Placer Gold Co. is installing electric motors at the placer mines. Electric hoists will be installed at the Good Hope and the King Solomon immediately, and many others will soon follow. There is no mining region in California that has so persistently advanced in development and production without electric power and with such great expense for water, entailed by the isolation of the districts and their proximity to the desert.

The U. S. Land Office Will Oppose the application of the Iron Chief Mining Co. for patent to 200 claims embracing about 4000 acres in Riverside County. The company acquired the property, which is reputed to contain large iron deposits, from the original entrymen. The contest of the Government is based on three points: That no discovery has been made upon certain of the claims; that less than $500 in labor and improvements has been expended on or for the benefit of each of certain claims, and that the millsite claim was not used or occupied for mining or milling purposes at the date of application for patent. The company has held the land for about five years. The applications for patent were filed in 1910 and 1911. An investigation was undertaken by the Land Office, which, it is reported, found that the work had not been done with a view to exposing or developing the deposits, nor with any idea of utility, but with the apparent purpose of merely complying with the letter of the law. The land is situated in about the center of Riverside County and on the desert. The deposit is reported to be one of the largest iron deposits in California. The Southern Pacific is said to be interested with the mining company in securing patent to the land, but there is no direct evidence that this is true. The report is current also that the company seeking patent contemplated the erection of a plant at Los Angeles upon securing legal possession of the claims. This report also lacks confirmation. It is a fact, however, that large interests in California, whose identity cannot at this time be made public, have for the last two or three years been making diligent inquiry regarding the iron deposits in the state. Besides several small deposits, and the mines at Heroult in Shasta County, there is a large body of iron ore well exposed, but in an almost inaccessible situation, in Madera County known as the Mineret district. This was prospected and located in 1891. The ore is said to be magnetite and hematite containing a large percentage of iron and practically free from sulphur. The subject of iron deposits was one especially contemplated by W. H. Storms when, as state mineralogist, he made an estimate of an appropriation necessary to carry out certain special work as well as the regular work of the State Mining Bureau.

DENVER—Feb. 21

A Discovery of Rich Silver Ore Has Been Made on Horse Mountain on Salt Creek in Eagle County. At present the ground is deeply covered with snow, making it impossible to trace outcrops, but the ground around the discovery has been thoroughly staked. Although the discovery was made last November, the facts have until recently been kept secret.

The Recently Elected Isabella Directors have chosen the following officers: Ira Harris, president, succeeding E. E. Quentin, of Denver; John T. Hawkins, vice-president and general manager, succeeding A. C. Gardner, of Denver; and J. R. Young, secretary-treasurer, succeeding E. M. Kirton. The new officers are Colorado Springs men.

An Option on El Paso Stock has been exercised; about 100,000 shares were given by James F. Burns to Allen L. Burris and Joseph Walker, Jr., some time ago, and full payment has now been made. By this transaction, the stock of the company is in control of Mr. Burris and his associates, and all danger of conflict over the policy of the company has been averted.

An Agreement between the Stratton's Independence and the Portland Gold Mining Co., made Sept. 30, 1912, has been filed for record with the county clerk and recorder and settles a suit of long standing, between those companies concerning some ore which was taken out along the line between them. It is agreed that the Stratton company will not take ore from under the Portland dump and the Portland agrees not to dump slime or sand containing more than 40% moisture in this place. The Portland company was the original plaintiff and the action was settled peaceably, the Stratton company giving eight acres for dumping ground.

BUTTE—Feb. 19

Fire in the West Colusa Mine of the Anaconda company broke out on the upper levels a few days ago, causing a flow of gas which necessitated hoisting the shift from the adjoining Mountain View mine until the connection between the two properties could be bulkheaded. The fire started in the heavily timbered portion of the mine on the 600-ft. level, and gained headway before being discovered. The West Colusa has been closed for the last few months while alterations were being made in the hoisting engine preliminary to hoisting with compressed air instead of steam. The Mountain View mine is connected with the workings of the Colusa on several levels, and the connections are being closed by concrete bulkheads to stop the flow of gas. Although the exact area of the fire zone has not been ascertained as yet, due to the difficulty of access caused by the gas, it is being blocked off as rapidly as posible, and within a short time will be completely hemmed in. No fatalities have occurred although several of the firemen have been overcome by smoke and gas.

SALT LAKE CITY—Feb. 20

Officers of the Salt Lake Stock & Mining Exchange were elected at a meeting of the board of governors held Jan. 27. R. J. Evans was elected president for 1913, and the other officers are W. D. Nebeker, first vice-president; C. W. Pratt, second vice-president; James A. Shorten, secretary; G. P. Norton and W. D. Nebeker, trustees for three-year term. Committees on arrangements, membership, listing, arbitration, etc., were appointed. A bureau of information, which will gather and supply information in regard to the Utah mining industry has been established. During 1912, a total of 11,989,408 shares of stock were traded in, the market value of which was $2,263,603.

The Third and Fourth Lead Furnaces at Tooele at the plant of the International Smelting & Refining Co., are nearly ready, and are expected to be put in blast this month. This will give the company a lead smelting capacity of 1000 tons of ore daily. A large amount of lead ore has been accumulated and stockpiled. Some copper ores have been received, but the copper furnaces, which were closed down at the time of the Bingham strike have not resumed operations.

Objection to the proposed mine taxation law now pending before the state legislature, according to which the expense of development work would not be deducted in arriving at net proceeds, is being made by Utah mining men. The present taxation is excessive and the proposed law violates precedent, and imposes new burdens. Objection is made to the bill on the grounds, that it will unjustly increase the taxation of the mining industry, which already bears more than its fair share; taxation of mines is defined by the constitution, and the proposed law would violate all precedent and common practice in eliminating, contrary to the constitution, legitimate items of expense in reaching net proceeds for taxation purposes; the proposed law would eliminate development work, depreciation, salaries, taxes and personal injury items of expense, insurance, etc., all of which are legitimate expenses to be considered before arriving at the amount of net proceeds, the legitimate and recognized expenditures necessarily involved in reaching net proceeds should not be taxed; the proposed law compels a mining company or mine owner to submit annually certified maps and detailed information of underground workings and ore deposits to the state board of equalization, to which none have any right except those whose funds and endeavors have made the same possible.

It is difficult to see why the state taxation commission maintains that mines do not bear their just share of the taxation. Mines pay on the full value of their net proceeds, while all other property in the state pays and has paid only on one-third of the actual value thereof. In 1911 the assessed value of net proceeds of Utah mines, not including equipment and improvements, practically equaled the assessed valuation of all the banks of the state. The arbitrary ruling out of certain legitimate items of expense by the state taxation commission was made in spite of the fact that the federal government allows development work, liberal depreciation, salaries, taxes, insurance, and personal injury expenditures in determining net proceeds. The filing of certified maps and other information by a company or mine owner, who has expended funds of shareholders to ascertain geological and other conditions, and so advertise to those owning adjoining territory whether friendly or not, physical conditions to which they are not entitled, and for which they incur no expense, or risk, is equivalent to exposing business secrets to competitors, who may derive all the benefits. A committee representing Utah mine owners appeared before the joint committee on revenue and taxation, Feb. 12, and protested against the proposed bill.

NEGAUNEE—Feb. 21

Rescue Car No. 8 of the U. S. Bureau of Mines, now at Iron River, has the following equipment: Eight oxygen helmets with a supply of oxygen in tanks, 1 doz. safety lamps, 1 collapsible steel mine cage for emergencies, 1 field telephone with 2000 ft. of wire, 1 pulmotor, and 1 first-aid outfit. One end of the car is fitted up as an air-tight room to be used in training men in the use of oxygen helmets. In the two months spent on the Gogebic range, the crew trained 95 men in first-aid and rescue work; lectures were delivered to 2500 people, 80% of whom were miners and mine officials, and the car received an average of 150 visitors per week. From Iron River the car will be moved to the Crystal Falls district, and from there to Florence, Wis., and Iron Mountain, Mich. The car is ready at a moment's notice to proceed to the scene of a disaster, where the rescue corps in coöperation with the company's officials will do everything possible to save entombed miners.

Increasing Transportation Facilities will be afforded by the new construction undertaken by the various railroad companies in anticipation of large iron ore shipments from the Lake Superior districts. The Chicago & Northwestern Ry., with docks at Escanaba, the nearest port to Chicago, serves principally the Menominee range but also the Marquette and Gogebic ranges. It will add 1000 new ore cars to its equipment. The Duluth, South Shore & Atlantic Ry., serving the Marquette range, will add 400 new steel cars. The Chicago, Milwaukee & St. Paul Ry. is hurrying construction on its 20 mile branch from Crystal Falls to Iron River, and plans to institute a vigorous ore-carrying campaign in territory formerly cared for principally by the Northwestern line. The new steel and concrete dock of the Lake Superior & Ishpeming Ry. at Marquette, which was completed several months ago at a cost of $1,250,000, has largely increased that railroad's facilities, and will only be surpassed by the dock soon to be built at Duluth by the Duluth, Missabe & Northern Ralway.

Important Developments in the Iron River District are apparent in a review of the mining industry for 1912. Corrigan, McKinney & Co. recommenced work at the Tully and Baker mines, resuming sinking at the Tully No. 1 shaft and preparing to sink a No. 2 shaft east of No. 1. The Munro Iron Mining Co., a Rogers-Brown subsidiary, extended the Rogers concrete shaft into rock and began hoisting ore. Jones & Laughlin made similar progress at the Forbes mine. Pickands, Mather & Co. worked the Caspian, Baltic and Fogarty mines to full capacity, and have developed the Bengal mine to about the same stage as the Rogers and Forbes. The Wickwire Mining Co. shipped from the Wickwire and Cortland mines, both new mines, and are developing the Virgil and Homer mines, the last named comprising the Donahue and McGovern properties taken over from the Rogers-Brown interests. The McGreevy Steel Co. was organized by Lake Superior men, and took over the Purcell, the old Sheridan, the Buckholtz, the Leroy and Boyington properties, at the first of which a shaft is being sunk. The Republic Iron & Steel Co. continued exploring at the Sherwood property on which the tax commission assessment of $740,000 indicates a large orebody. The output of the Iron River district for the season was 1,800,000 tons, the largest in its history.

JOPLIN, MO.—Feb. 21

Zinc Ore Prices Are Stronger by $1 per ton, the best base price for the week being $49 for grades carrying 60% metallic zinc. The demand for calamine is strong and the production heavy; the best bids being made by the Edgar Zinc Co., of St. Louis, which took the bulk of the output. About 40 of the mine operators, most of them from the Webb City district, have agreed on a 30-day shutdown or longer, which began the first of the week. Ideal weather has prevailed up to the rains of the last few days, which will cause some more of the smaller properties to close down. However, notwithstanding present market conditions, prospecting and mining is going on at full capacity in some parts of the camp, especially the calamine and soft-ground mines.

COBALT—Feb. 14

The Largest Single Shipment of Bullion ever made in the Dominion of Canada, left Cobalt for England a few days ago. Altogether, there were 263 bars containing 308,997 oz. valued at approximately, $187,567.

On Behalf of Himself and Other Seneca Superior Shareholders, except the individual defendants, Herbert E. Jackman wants it declared that an agreement whereby S. Harry Worth was given an option on certain shares of the company, was void prior to Oct. 12, 1912. Mr. Jackson also asks that certificates purporting to be issued on Oct. 12, 1912, be canceled. Mr. Jackman also sues for the following: That all sales of stock by or on behalf of the company made after the discovery of a certain vein upon the property and particularly the said pretended sale of 75,000 shares to the defendant, W. E. Segsworth, was void as a fraud upon the plaintiff and other shareholders of the company. The defendants include S. Harry Worth, R. E. Segsworth, W. E. Segsworth, C. W. Wagner and the Seneca Superior Silver Mines, Ltd. The plaintiff gets an interim injunction.

TORONTO—Feb. 14

The Mines Branch and Geological Survey, of Canada, were recently transferred from the Department of the Interior and placed under the control of the Secretary of State, Hon. Louis Coderre.

The Jarvis Oil & Gas Co., with head office at Toronto, has been formed, with an authorized capital of $40,000 in $10 shares, to work a property near Jarvis, Ont. The owners of this property, some time ago, drilled a hole about 2300 ft. deep and struck what was claimed to be oil-bearing sands. The hole was not cased, however, and caved, so it had to be abandoned. The intention is to sink other deep holes to thoroughly prospect this area.

VANCOUVER, B. C.—Feb. 11

In British Columbia, 200 Mining Companies Have Been Dissolved under the "companies act" of British Columbia, leaving them powerless to engage in development, production or work of any kind. The total capital of these companies is about $200,000,000 and many of the shareholders are Washington men. Reinstatement cannot be accomplished, and to protect themselves the stockholders must engage in foreclosure proceedings, incorporate a new company and engage in other affairs which, with attorneys' fees, will cost about $1000 for each corporation, or a total exceeding $200,000 for the companies involved. The validity of the parliament action is questioned throughout the province. Washington stockholders charge that they were left in darkness as to the existence of the law, which was passed in 1910, and that they have not been notified that they were in arrears with the government as is specified should be done in the act.

THE MINING NEWS

ALASKA

ALICE—About $30,000 has been spent for improvements of this property on Shoup Bay. A power plant including boilers, compressors, hoist and an electric lighting plant have been installed.

SWEEPSTAKE—High-grade ore was recently encountered at this property and a large force of men is at work. A wharf and an 800-ft. tram are to be built this spring. Colonel O'Neil, Fort Liscum is interested.

REXALL—One-third interest in the Cooper Horton lease on this claim has been sold to G. F. Johnson by Jack Cooper for $3000. A third interest in the mill recently erected was included in the transfer.

GOLD KING—A new vein has been opened at this mine, in which there are shoots of high-grade ore. This property is at a great elevation on the divide between Shoup and Columbia glaciers, making winter work expensive.

EMMA—This claim at the head of Willow Creek, is under lease to Dr. Overguard, of Fairbanks; 30 tons of ore put through the Newsboy mill returned $45 per ton. The extension of the vein on the Bedrock side of the ridge is being prospected by August Hess and Jack Burnett.

NEWSBOY—The ore in the faulted portion of the vein on the 215-ft. level is reported to be of a good milling grade, and stoping will be commenced at once. On the 315-ft. level the vein has averaged about 48 inches in width; although the ore is of rather low grade, it is being stoped and sent to the mill.

TANANA WATER & POWER CO.—This company owns coal claims and placer interests in the Tatlanika watershed, and also a water power site below the falls of that river. John Timmins, of Fairbanks, is manager. The plans of the company call for a 10,000 kw. plant, to be operated by water power in summer and steam in winter. The preliminary work will be started at once, provided contracts for 2000 kw. at 3c. per kw.-hr. can be secured in the Fairbanks district, to which a high-tension transmission line will be built.

HUBBARD-ELLIOTT COPPER CO.—Judge Lyons, at Valdez, has granted a nonsuit in the case brought by George Treat, et al, to set aside the transfer of the Hubbard-Elliott Copper Mines Co., to the Hubbard-Elliott Copper Co. The property owned by the defendant company consists of a group of copper claims in the Kotsina district. The mine was developed by the late Henry Curtis Elliott, of Chicago. Development has been in progress since 1902, and much money is said to have been spent on the property. Most of the stock is held by California and Chicago people.

ARIZONA

Gila County

SOUTH LIVE OAK—Drill No. 6 finished the hole at a depth of 1017 ft. in ground that the management is said to regard as encouraging.

Mohave County

GOLD HILL—J. M. Orozco has made a new strike on this gold property in Agua Caliente cañon.

GOLD RIDGE—A company has been formed by J. H. Evans to work this mine, acquired recently from John Costello.

PITTSBURGH—A new strike has been made on this group; in the upper tunnel on the vein good milling ore has been crosscut.

WANDERING JEW—A new strike of rich copper-silver ore has been made in the drift on the main vein on the 200-ft. level. Sinking will shortly be resumed on this vein.

NEIGHBORS—This group, bonded to the Copper Queen by Neighbors, Pyatt, McCarty and Sheehy, and adjoining the World's Fair, is reported to have struck ore of good quality.

Santa Cruz County

GERMAN-AMERICAN—Men have recently been put to work on this property, at Vivian, and it is reported that some good ore has been found.

MINNESOTA-CONNOR—It is stated that arrangements have been made to sink the new shaft, in which steel sets are used, to a depth of 750 ft.

RAINBOW—This property is shipping a carload per day of lead ore to the smelter. It is the intention of the manager, H. L. McCarn, to sink another 150 ft. on to the 600-ft. level.

SMITH-HOFFMAN—A shipment of about six tons of silver-lead ore was recently made from this property to Yucca by auto-truck. The property is being worked by lessees who are said to be making good profits.

COPPER BASIN—It is reported that a branch railroad is to be built by the Lewisohns from the main line of the Santa Fé at Seligman to Bouse on the Arizona & California R.R. This will open up the Copper Basin country where deposits of copper are believed to exist.

GRAND CANYON GOLD DREDGING CO.—This company has been incorporated by M. W. Musgrove, of Kingman, James A. Roberts, of New York, and Nicholas P. Bond, of Baltimore; capital $2,250,000. The company plans to dredge the Colorado River near the mouth of the Grand Canyon, north of Kingman.

CALIFORNIA

Amador County

SOUTH EUREKA—Progress is now being made in clearing the caved shaft; as soon as the pumps are clear the mine will be unwatered.

Butte County

MINERAL SLIDE—It is reported that Moody and Cohan have given an option on this mine in the Magalia district.

BLUE HOG—A new wagon road three miles long will be built to connect the mine with the town of Pentz. Charles Hendrix is superintendent.

TRIUMPH—It is reported that a cyanide mill will be built at this mine at Lumpkin, which is now equipped with two stamps and a Beer roller mill.

MAGALIA DISTRICT is reported to have an abundance of snow, assuring a water supply amply sufficient for mining requirements during the coming season. Work is being resumed at the Kirby, Robbers' Roost, Last Chance, Golden Channel, Blue Hog, Mineral Slide, Valhalla, and Kidd mines.

Calaveras County

DOLLING—Satisfactory development is reported from this mine at Angels.

PENN MINING CO.—Although thiogen experiments are being continued the farmers are still talking of commencing legal action.

Eldorado County

STRICKER CO.—This company is organized to develop the Coffin & Reid placer mine on Texas Hill, four miles north of Placerville. Louis N. Stricker, president.

ADJUSTA—A 16-hp. gasoline engine has been installed to drive this 10-stamp mill in the Mud Springs district; steam power was formerly used. O. A. Ingraham, of Placerville owner.

BARNEY & CHANCLER—A 5-ft. vein has been disclosed at a depth of 72 ft. in the vertical shaft, at this property at Omo Ranch in the Indian Springs district. Charles Edner, owner.

HILLSIDE—The 15-stamp mill being built at this mine, south of the Union mine in the Mud Springs district, is made up of the five stamps formerly operated and 10 new stamps. W. G. Busick, of El Dorado, manager.

Humboldt County

RUBY COPPER CO.—N. H. Falk, of Eureka, has been elected vice-president. The property on Horse mountain has been partially developed by a 300-ft. tunnel.

Imperial County

POPLIN MINING & MILLING CO.—This is a new company organized at Blythe, Riverside County, to develop the Erma group of claims near the Old Bay Horse mine in Picacho district. Thomas Poplin is president.

Inyo County

CUSTER—This mine in the Darwin district is shipping high-grade silver-lead ore. John Thorndike is manager.

LUCKY JIM—Regular shipments of good grade of silver-lead ore are being made. Charles W. Collins, of Darwin, owner.

CHRISTMAS GIFT—Hoists, air drills and other mining machinery are being installed, at this mine in the Darwin district.

DARWIN DISTRICT is reported active; about 250 tons of high-grade silver-lead ore per month is being hauled by wagon 24 miles to Keeler, on the Southern Pacific.

Kern County

RED DOG MILL—Upon completion of the repairs of the Randsburg Water Co., plant, the mill has resumed operation.

KING SOLOMON—A new 2-compartment inclined shaft will be sunk, and will be connected by a raise, with the 100-ft. level. A new electric hoist will be installed at this shaft.

SIERRA MINING CO.—This is a new company recently organized at Johannesburg to develop and operate mining claims in the Indian Wells district recently discovered. Edward Teagle, president.

ELECTRIC POWER FOR RANDSBURG MINES will be available for the mines in the Randsburg, Stringer, and other mining districts as soon as the installation of transformers is completed by the Southern Sierras Power Co.

KING SOLOMON—The Teagle-Lamberson drift east of the shaft on the 85-ft. level has been extended 50 ft. and 17 tons of ore have been added to the 30 tons recently hauled to the Red Dog mill. The Wickard lease has 20 tons on the dump.

San Bernardino County

THE BROWN MOUNTAIN AND HIDDEN SPRINGS SILVER STRIKES are reported to be attracting attention of prospectors and engineers. The ore is said to contain high-grade silver and lead. Brown mountain is in the northern edge of San Bernardino County, 20 miles east of the Kern County line and about 60 miles northeast of Randsburg. Hidden Springs lies about seven miles east of Brown Mountain. Both are on the lower edge of Death Valley and near the Inyo County line. The Brown Mountain discovery was made by F. M. Myrick, a gemstone miner. The Hidden Springs find was made by George Lewis, of Randsburg.

COLORADO

Clear Creek County

CLARA—A 2-ft. vein of ore, said to assay $20, has been opened. The company's mill is in satisfactory operation.

BALD EAGLE—This property, in Virginia Cañon, after several years idleness, is being placed in order preparatory to resumption of operations; Robert Callow, Jr., is lessee and manager.

OLD TOWN—A 3-ft. vein of smelting ore has been opened on the 14th level, 400 ft. west of the main shaft. A crosscut is being driven to the Terror vein. George K. Kimball is manager.

GLADSTONE—This property is being reopened by Jaynes & Co. The compressed-air power required for the drills is being purchased from the Stanley Mines Co.; Charles L. Jaynes, of Idaho Springs, is manager.

TOBIN—This property will soon be more actively developed by a new company being organized by J. B. Knaube. Some high-grade silver ore is being opened and a trial shipment has been made to the smelter at Salida.

COLORADO McKELVEY MILLING CO.—Changes and improvements are being made in the mill, at Idaho Springs. A new Abbé grinder will be installed, which, it is expected, will make a product suitable for treatment by the McKelvey amalgamating process.

ONEIDA—Drifting is in progress on the main level; 8 men are employed on development work. A crosscut is being driven to prospect for parallel veins. The mill building is completed and ready to receive the machinery which will be installed during the early spring.

SILVER PLUME MINING & TUNNEL CO.—This company has made trial shipments from its property, two miles above Silver Plume. The ore assays range from $75 to $150 per ton. An active campaign of development is contemplated; H. L. Roberts, of Idaho Springs, is president and manager.

BELLEVUE-HUDSON—Promising ore has been developed in the drift from the bottom of the 200-ft. winze on the Rochester level. The vein is 2 ft. wide and has been opened for a distance of 150 ft. The ore assays range from 200 to 300 oz. silver. Three shifts are being worked in the stope. George W. Boyce is manager.

ROCKFORD TUNNEL—Lessees are developing the Donaldson and Magalona veins with satisfactory results. A promising oreshoot has been opened on the Donaldson vein for a length of 125 ft. This discovery is 600 ft. below the old upper workings and is probably the downward extension of one of the old shoots mined above.

TERRIBLE-DUNDERBERG—Plans are being made to resume active development of this property in the near future. It is proposed to sink the shaft 200 ft. deeper to a total depth of 1600 ft. from the surface and advance levels from the 10th to the 14th westward. The 50-ton mill and the compressor plant will be overhauled and placed in working order. B. C. Catern is manager.

PHOENIX-BURROUGHS—The recent attempt to unwater this property by diamond-drill holes from the Newhouse tunnel lateral has been partially successful. The water level in the upper workings has been lowered and a careful examination will be made through the Ophir-Burroughs shaft. The present discharge of the two diamond-drill holes is approximately 60 gal. per min. The company contemplates raising from the Newhouse tunnel level to the lowest workings of the mine to complete the unwatering and provide for the economical operation of the property; Robert Sayre is manager.

ARGO REDUCTION & ORE PURCHASING CO.—This company, owner of the Argo mill, at Idaho Springs, is ready to receive ore shipments. The sampling department is in operating condition and the company has about 1000 tons of ore in the bins. The first schedule is arranged, which is an improvement on prevailing smelter rates. On ores running high in silver it would not be as favorable, but under such circumstances the company will apply the smelter rates for like ores. The officers of the company are: F. A. Schirmer, of Boston, Mass., president; R. E. Schirmer, of Idaho Springs, Colo., secretary-treasurer; and Arthur H. Roller, of Idaho Springs, Colo., manager.

Gilpin County

WAR DANCE—Recent shipments from the orebody on the 250-ft. level have been satisfactory. Three classes of ore are produced. The first-class ore assays $240, the second-class $80, and the third-class $40 per ton; John Larson is manager.

Lake County-Leadville

ELLA BEELER—Lessees in this mine are driving the upper tunnel and shortly expect to cut the old Houston vein, and add materially to the monthly output. Ore is still being broken in the lower tunnel with the grade holding up to the standard.

STARS CONSOLIDATED—A drift is being driven from the bottom of the lower level at No. 5 shaft into new territory to find another body of iron ore. From the different shafts controlled by the company and under lease the monthly shipments exceed 3000 tons.

Teller County-Cripple Creek

CRESSON—In January 3300 tons of ore was shipped which averaged about $20 per ton. It was taken from the reserves above the 11th level as the better grade of ore on level 12 was not available because of the fact that the shaft was being deepened.

GOLD SOVEREIGN—A 10-year lease, one of the longest leases ever granted on a Cripple Creek mine, has been obtained by the Union Leasing Co. The agreement contains a clause to the effect that within 90 days after Jan. 20, the day of signing the lease, construction work on a cyanide mill shall be started and that the mill shall be completed within six months. The lease is given on the mine and dump.

IDAHO

Shoshone County

WESTERN SILVER-LEAD MINING CO.—This company has acquired the O. K. mine in Government Gulch and the Double Four and Hathaway groups on Butte Creek; these properties have been fully paid for. Recently the company acquired the Jim Blaine group of eight claims and a millsite on Pine Creek on favorable terms. Work is being done on the O. K., Jim Blaine and Double Four groups. Machinery, including a 600-cu.ft. compressor, has been ordered for the O. K. mine. The plant will be operated by electricity and an electric hoist will replace the one now in use. The new plant will be in operation about May 1.

MICHIGAN

Copper

CALUMET & HECLA—One of the two large refining furnaces recently added to the works at Lake Linden recently went into commission. The second furnace will soon be in service and a daily charge of 175,000 lb. of copper will be drawn off.

COPPER RANGE—The Hardinge-mill regrinding system which is being installed at the Baltic stamp mill will be completed and in running order within a few weeks. The machinery for utilizing the exhaust steam now being wasted is set up and will develop power to drive the regrinding machinery.

QUINCY—The shaft on the Pontiac tract has reached a depth of about 3000 ft. and attention is being given to the extension of lateral openings. The ore coming from these openings is being sent to the mill. This company is diamond drilling from the workings in No. 2 shaft in the hanging wall with the object of locating the extension of the Hancock lodes.

ISLE ROYALE—Small shipments of ore from the Grand Portage lode are being made to the mill. The results obtained so far on the formation are encouraging. A sand pipe is being sunk to the lode to test the overburden and it is likely that sinking the new No. 7 shaft will be resumed at an early date. Work at this place has been suspended for some time owing to the difficulty in getting the shaft established in the formation.

Iron

JOHNSON—The exploration which has been carried on for several months on the Johnson land, in the Beechwood section of the Iron River district, has been discontinued. This section, northwest of Iron River, is being investigated geologically by several exploration companies, and more drilling is planned for the future. Iron formation has been found at several widely separated places.

CLEVELAND-CLIFFS IRON CO.—This company has requested the city officials of Negaunee for permission to change to the north the highway leading toward Marquette. The company's Maas and Negaunee mines, the former on the north side of the road and the latter on the south side, have ore under the highway which, when extracted, will cause caving. A few years ago the company moved the Negaunee Cemetery of several thousand bodies from the same vicinity.

MISSOURI

IN THE ACTION TO OUST STANDARD OIL from Missouri attorneys for the Standard Oil Co., of Indiana filed a motion for a re-hearing of the decree ousting the company from the state. The motion argues that three new judges in the court passed on the ouster decree without having heard the evidence; that the Waters-Pierce Oil Co. is no longer controlled by Standard Oil interests and that the ouster should not apply to the refinery at Sugar Creek, which should be allowed to refine oil for interstate commerce.

Christian County

LEAD ORE IN THE CHADWICK DISTRICT is reported to occur in abundance in fissure veins. On one 120-acre tract five veins outcrop; the average width is 3 ft. Two of these have been developed for 1300 ft. and 240,000 lb. of galena has been taken out from 1 to 15 ft. in depth. The principal showings are on the Springdale ranch where some mining has been done. Modern equipment is being installed on the more promising properties and the Frisco railroad has completed surveys for extensions from Chadwick to the mines. Electric power is available from the hydro-electric plant on White River 15 miles distant.

Flat River District

FEDERAL LEAD CO.—This company operating lead mines in the Flat River district of southeastern Missouri is entering the southwestern field. An option has been taken on four 40-acre tracts of mineral land west of Joplin. The same company has already taken over the Hackett mine and mill now known as the Sunny Brook and which is adjacent to the present options.

Joplin District

THREE DRILL RIGS AT DUENWEG are being operated on a 120-acre lease of the Norton land. Rigs are also drilling on other parts of the land; Louisville men being interested.

SYMMES MINING CO.—New jigs and other equipment are being installed in the mill on a lease of the Reisling estate. The company intends to develop the deep sheet-ground formation.

AMERICAN ZINC, LEAD & SMELTING CO.—Recent development work on lands of this company in the West Joplin Camp has resulted in the opening of some good ore at a depth of 100 to 120 ft. The Red Cloud Mining Co. has a lease of 60 acres, half of which is sub-leased in small tracts. The Old Times mill has been converted into a custom plant and is operated by the Red Cloud Co. treating the ore of the sub-lessees.

GRANBY MINING & SMELTING CO.—A test run has just been completed on ore from the B. &. H shaft in the Chitwood district; 400 tons was run through the Katy Lou mill giving 64,000 lb. of concentrates which were sold at $48 base.

The tailings still showed between 3 and 4%. With the view of determining the best class of mill to treat the ore another run is being made at the Grace mill also on the Granby lands. The ore is encountered at 120 ft. and extends to 150 ft. depth.

MONTANA

Butte District

WEST COLUSA—All work in this mine has been stopped because of the spreading of the fire, said now to cover an area of two city blocks and to have reached the 600-ft. level.

BULLWACKER—It is reported that the capacity of the 50-ton copper-ore leaching plant, near Butte, will be increased to 250 tons daily. Crushing machinery of 500 tons daily capacity will be installed as the mill may again be enlarged to treat that quantity of ore.

BUTTE-CENTRAL COPPER CO.—The recently completed mill at the Ophir property of this company was placed in operation, Feb. 16; it proved quite satisfactory in the test run. The ore now being mined is taken from the 300- and 500-ft. levels, and assays from 10 to 20 oz. of silver, and from $1 to $3 in gold. After being crushed the ore will be treated on Deister tables, and the slimes treated in a cyanide plant being built in conjunction with the mill. It is expected that the cyanide plant will be ready for operation in about two weeks

Deer Lodge County

BALTIC-COMBINATION—A wide vein was recently opened in crosscutting at this property, and is now being drifted on in both directions. A crosscut is being driven west from the shaft to tap a vein which outcrops strongly on the surface.

GEORGETOWN GOLD MINING CO—This company has for several months been driving a tunnel on excellent ore on the Duplex claim. A crosscut is now being driven at a distance of 500 ft. from the portal of the tunnel to determine the width of the vein.

SOUTHERN CROSS—In sinking the shaft at this property in the Georgetown district a new vein was recently encountered below the 300-ft. level. The ore is several feet in width and assays between $15 and $20 gold. Upon the arrival of the transformers, the new electric hoist will be placed in operation.

BUTTE-PACIFIC—This company owns 12 claims 2½ miles east of Warm Springs, and is preparing to begin development work on the property. Surface workings and shallow shafts have disclosed several veins of lead-silver ore containing a little copper. The rock is granite, similar to that of the Butte district.

BLUE EYED NELLIE—The work of reopening the old workings of this property near Anaconda, is going ahead steadily, and the mine will soon be in condition to produce lead-silver ore. A new shaft house has been erected and a gasoline hoist installed. Levels are being retimbered and cleaned. The present operators hold a lease on the mine.

Granite County

GOLD LEAF—A vein of $10 gold ore has been opened by Frank D. Lutz.

Jefferson County

ELKHORN MINING CO.—This company has been incorporated for $1,000,000 by Butte men for operating claims in the Elkhorn district, a short distance from the famous Elkhorn mine; E. C. Largey, president.

Madison County

BLOWOUT—The Corbin Copper Co., which purchased this copper property in the Rochester district several months ago, is engaged in sinking the shaft. More water has been encountered than was anticipated.

NEVADA

Comstock Lode

CROWN POINT—A run of ore has just been completed at the Yellow Jacket mill, and a railroad car of concentrate shipped to the smelter, the second of the run.

CONSOLIDATED VIRGINIA—The exploration drift on the 2500-ft. level, from the north boundary line of the mine, has encountered more quartz and the vein proves to be stronger as progress is made southerly.

EAST COMSTOCK REDUCTION CO.—This company has just been incorporated to operate a milling plant in the Six Mile Cañon district, now being actively developed.

SIERRA NEVADA—Repairs have been completed to the motor of the joint-winze hoist, and both this company and Union Consolidated have resumed operations at the 2500- and 2650-ft. level after being held up for a month.

SEG. BELCHER—A narrow seam of quartz is reported in the face of the east crosscut on the 1200-ft. level, at a point 824 ft. from the mouth of the drift. This crosscut is penetrating ground far east of any former workings in the Gold Hill section.

OPHIR—A chute has been completed at the understope on the 2500-ft. level, and the daily tonnage of ore extracted is being increased. Shipment of ore has been resumed to the Kinkead mill, and the cyanide plant is shipping bullion twice a month to the smelter.

ALTA—This company has withdrawn from the United Comstock Pumping Association, and will join with Crown Point, Belcher and Yellow Jacket in deep mining operations in the Gold Hill section. Two pumps are to be placed in the Crown Point and one in the Alta, to lower the water level.

MEXICAN—The remaining material for the aërial tramway being built to connect the mill to the Monte Cristo and Keyes mines in Seven-mile cañon has arrived, and is being installed. It is proposed to have the tram in working order by early spring, and shipment of ore from the cañon will begin. A large tonnage has been accumulated at the Monte Cristo terminal. It is rumored that the Mexican company will acquire other properties outside the Comstock district.

Nye County

Shipments in tons from Tonopah mines for the week ended Feb. 15, are as follows:

Tonopah Mining	3450	North Star	....
Tonopah Belmont	3393	Mizpah Extension	....
Montana-Tonopah	972	Jim Butler	500
Tonopah Extension	1120	Tonopah Merger	220
West End	1010		
Midway	100	Total	11,297
MacNamara	532	Estimated value	$237,110

White Pine County

NEVADA CONSOLIDATED—Ideal February weather has enabled resumption of normal production. At the Eureka and Liberty pits there is a full stock of coal. All of the steam shovels and drills are in operation. The Veteran mine is shipping about 900 tons per day and about 350 men are now employed. It has been found that the bodies of porphyry supposed to be the limit of the ores, are only irregular intrusions with ore on the other side.

GIROUX—This company is shipping 1100 tons per day to the Steptoe smeltery; about 400 men are employed underground. It is expected that the blocking out of the Bunker Hill, Brooks and Morris orebodies on the 200-ft. level and above to the capping will be completed soon, when the force can be reduced by half.

NEW MEXICO

Grant County

CHINO COPPER CO.—The production of copper in the last quarter of 1912, was, according to the quarterly report, 11,067,864 lb. or 3,689,288 lb. per month; the total production for the year was 29,237,966 lb. In the last quarter 452,650 tons of ore was milled and in the year 1,120,375 tons.

Socorro County

MOGOLLON MINES CO.—A new engine, compressor, drills of development has been laid out for the Cooney mine as soon as it can be unwatered, preparations for which are now being made. Ore is being shipped to one of the custom mills from the Little Charlie.

OREGON

Lane County

TREASURE—This mine situated 40 miles southeast of Eugene in the Blue River district has just been sold by Glen. O. Powers and others of Blue River to Charles A. Phelps of Los Angeles, Calif., and his associates.

UTAH

Beaver County

SOUTH UTAH—Some new ore is reported on the 500 level.

MONTREAL—An examination of this property, near Milford, has been made in the interests of English capital.

CEDAR-TALISMAN—This property has recently changed hands, and an assessment of ½c. a share has been levied for development purposes.

MOSCOW—The fourth dividend was sent to stockholders, Feb. 16. Development work is being done with machine drills on the 300-, 400-, 500- and 600-ft. levels. There are two compressors and the boiler capacity has been increased. The winze from the 600 is down 50 ft. in good ore. This is the same shoot that was followed from the 400. About four cars of ore weekly are being shipped.

Juab

TINTIC SHIPMENTS for the week ended Feb. 14 were 183 cars.

CROWN POINT—An assessment of ¼c. per share has been levied.

TINTIC CENTRAL—The annual report shows receipts for the year to have been $15,921. There is about $497 cash on hand. Work is being done on the 920 level.

OPOHONGO—Some ore is now being stoped from a winze below the 700 level, the remainder of the mine's output coming from stopes near the 500. A drift is now being driven for the ore between the 600- and 700-ft. levels.

CHIEF CONSOLIDATED—During January, 8000 tons of ore and waste were hoisted. About 900 ft. of development was done. The main shaft is now below the 1800 level, and sinking will be continued until water level is reached, which it is thought is not far distant.

GOLD CHAIN—A dividend of 3c. per share was declared Feb. 10, payable Feb. 25. The total amount is $30,000. This is the fourth dividend, the first having been paid in June, 1912. Including the present dividend, $100,000 will have been paid to stockholders. During January, 51 cars of ore were shipped.

IRON BLOSSOM—Ore is being mined from the 200- to the 600-ft. levels. With what is developed, there is stated to be enough to continue the present rate of shipments for some time. Prospecting at depth is being done now that the new electrical equipment has been installed. A fissure on the 1900 level is being followed. This carried ore down to the 800 level.

Salt Lake County

GILES MINING & MILLING—The new tunnel at this property, in Big Cottonwood, is in 476 feet.

COLUMBUS EXTENSION—This company has decided not to enter the proposed merger of the Columbus Consolidated, Flagstaff and Superior Alta.

OHIO COPPER CO.—The dam at the tailings pond has broken, carrying out a large portion of the water mains, which necessitated closing down to put in new pipes.

COLUMBUS CONSOLIDATED—A special stockholders' meeting has been called for Feb. 28 to ratify or disapprove the proposed merger with the Superior Alta and Flagstaff companies.

UTAH METAL MINING CO.—The annual report has been sent to stockholders. During the year there was expended $98,786, making the total during the last three years $314,393, in addition to amounts expended by the original owners. The company is driving a tunnel from Pine Cañon on the Tooele side of the range to Carr Fork. This tunnel will be 11,490 ft. long, and should be completed by the latter part of April. On Jan. 11, 1913, a total of 10,586 ft. had been driven, 908 ft. remaining uncompleted. Work at the Bingham end was stopped in September on account of the strike; work on the Tooele side was continued throughout the year. The average cost per foot has been about $16.45. When the tunnel is completed, it will be used to transport ore from mines on the Bingham side to the International smeltery. Several ore-bearing fissures up to 2 ft. between walls have been cut, and will be further developed, when the main work is completed. The tunnel entered the Jordan limestone early in December. E. P. Jennings, of Salt Lake City, who has been consulting engineer for the last two years, has been elected director and president to fill the vacancy caused by W. B. Farmer's resignation.

San Juan County

A STRIKE OF OIL is reported near the east end of the San Juan oil field just over the Utah line in New Mexico. The oil was struck in a 1700-ft. well, 15 miles west of Farmington. It has risen to within 400 ft. of the surface.

Summit County

PARK CITY SHIPMENTS for the week ended Feb. 14 amounted to 2,971,240 pounds.

DALY—A donkey engine and other machinery has arrived, and will be installed on the old tunnel level.

SILVER KING CONSOLIDATED—Sinking from the 1300- to the 1800-ft. levels of the main shaft has been started.

DIAMOND-NIMROD—Efforts are being made by some of the larger creditors to have this property sold at sheriff's sale.

NEW YORK BONANZA—Operations were suspended about Jan. 1. An assessment of 3½c. per share has been levied to meet the outstanding indebtedness.

FLAGSTAFF—A strike of high-grade carbonate ore is reported on the 1200 level. About 50 tons have been shipped since the first of the year.

Tooele County

OPHIR HILL—The mill is being enlarged from 150 to 300 tons capacity.

LION HILL CONSOLIDATED—A new orebody is being opened 350 ft. north of the old workings.

WASHINGTON

Ferry County

ANACONDA—An 80-hp. oil-burning engine, compressor, electric lighting plant and other equipment are to be installed at this mine in the Republic district.

Okanogan County

O'NEIL—A gasoline hoist and other equipment will be installed at this mine near Nespelem.

APACHE—A carload of ore was recently shipped. New machinery has been installed, and preparations are made for increasing the force.

MULTNOMAH—Good ore has been encountered at this property, and considerable development work is being done. T. O. Hudnutt, Nespelem, is general manager.

DOUBLE HEADER—Some fine bodies of silver ore have been opened on this property at Nespelem, and the company is considering the installation of a cyanide plant. L. C. Shuff, Seattle, is secretary.

Stevens County

SECURITY COPPER CO.—This company has purchased the Matterhorn mine. New machinery will be installed, and the property placed on a shipping basis.

CANADA

British Columbia

BRITANNIA—According to press dispatches, the refusal of the company to recognize the Western Federation of Miners has resulted in a walkout at the mines.

SILVER-HOARD—The same shoot of ore that was pierced in the upper workings, has been struck on the 100-ft. level of this mine, at Ainsworth. W. S. Hawley is manager.

UTICA MINES, LTD.—Shipments from the property of this company in 1912 aggregated 670 tons, of a gross value of $67,000 in silver and lead; zinc penalties aggregated $5000. C. C. Caldwell is manager of the company at Kaslo.

RICHMOND CONSOLIDATED—This mine, the Lily May and Rochester properties in the South Belt of the Rossland district are reported to be bonded to a New York syndicate. An inspection of the properties was made recently by some of the men interested.

Ontario

FIRE NEARLY DESTROYED ELK LAKE CITY Feb. 15, according to press dispatches from North Bay.

ST. ANTHONY—At this property, in the Sturgeon Lake gold area, operated by the Northern Gold Reef, Ltd., a continuous orebody has been proved for 125 ft. A 10-stamp mill and tube mill with cyaniding annex has been built and is ready for operation.

Ontario—Cobalt

ALEXANDRA—Drifting has been started on the 300-ft. level in the conglomerate to reach the Bailey vein.

SILVER CLIFF—Active operations have been started on this property, which has been closed down for the last 14 months.

SALVATOR—On this property, formerly known as the Wright claim, mine buildings are being constructed and about a dozen men are at work.

DRUMMOND—A 30-hp. electric motor for hoisting is being installed. Milling ore extracted from the large shoot on the 125-ft. level keeps 20 stamps of the Northern Customs concentrator running at capacity.

BUFFALO—The regular quarterly dividend of 5% has been declared and also two extra dividends, one of 15% payable Apr. 1, and another of 3% payable May 15. With the payments of these dividends, the company will have distributed more than 200% on its capital.

SENECA-SUPERIOR—The annual report shows a total production of nearly $200,000, and net profits of $121,618, of which a dividend of 10% was paid, leaving a surplus on Jan. 31 of $73,980. R. H. Lyman, mine manager, stated that the Worth vein discovered early in October had been developed for 213 ft. and had shown an average of 3500 oz. silver to the ton for this distance.

SHIPMENTS of ore and concentrates, in tons, from Cobalt for January, were as follows:

Bailey	21.18	Kerr Lake	89.53
Beaver	26.04	La Rose	274.44
Buffalo	.....	Lost and Found	.....
Casey Cobalt	.....	McKinley-Darragh	155.87
Chambers-Ferland	63.20	Nipissing	57.29
City of Cobalt	32.94	O'Brien	53.69
Cobalt Lake	64.27	Penn.-Canadian	.....
Cobalt Townsite	210.68	Provincial	.....
Colonial	.....	Right of Way	.....
Coniagas	131.16	Seneca Superior	42.15
Crown Reserve	90.37	Silver Queen	.....
Dominion Reduction Co.	.....	Timiskaming	93.70
Drummond	62.60	Trethewey	54.39
General Mines	.....	Wettlaufer	.....
Green Meehan	12.96		
Hargraves	.....	Total	1598.51
Hudson Bay	62.05		

Ontario—Porcupine

WRIGHT-HARGRAVES—These Swastika claims have been sold to Buffalo people.

TOUGH—Another shipment of gold ore has been made from this Kirkland Lake property.

GOLDFIELDS, LTD.—It is announced that this company will add another 30 stamps to the mill, making 60 in all, and giving a capacity of about 500 tons per day.

JUPITER—Work has again been resumed on this property, which has been closed down since the strike. As soon as the mine is pumped out, development work will be started. A new plant has been ordered to permit deeper mining.

VIPOND—A special general shareholders' meeting was called for Feb. 26, to ratify the proposed issue of $125,000 bonds to provide funds for enlarging and completing the plant and to provide funds for development. The bonds are to be issued at $102 to bear interest at 7% and will carry a 25% stock bonus.

Yukon Territory

YUKON GOLD CO.—An explosion, cause not known here, opened a hole in the hull of one of the electrically driven dredges near Dawson. Ice in the pond prevented sinking. The damage is confined to the stern and it is expected that the hull, tailings stacker and save-all can be repaired before the opening of the season.

MEXICO

Jalisco

EL FAVOR—In December the company shipped 386 tons of high-grade ore to the Aguascalientes smeltery, the net value of which was 62,635 pesos. A total of 1143 tons of El Favor ore was milled, producing bullion and concentrates to the value of 17,418 pesos. The total profit on the month's operations was 51,070 pesos. The 20-stamp mill ran 87% of the possible time and crushed a total of 1967 tons of mixed ores from the El Favor, Mololoa and Mirador mines. The total value of the bullion produced was 35,718 pesos, and concentrates 8156 pesos. The company will pay its first dividend, amounting to $35,000, Jan. 30, 1912.

Mexico

ESPERANZA LTD.—In January 5542 tons of ore was crushed and 9044 tons of tailings were treated, the yield being $107,960, of which $26,697 was net profit.

San Luis Potosi

TIRO GENERAL—An attack was made on this mine by bandits who were repulsed by the mine force; one American was injured. The mine is reported closed and most of the staff have gone to San Luis Potosi.

Sonora

LUCKY TIGER—In January 3213 tons of ore was crushed, 5502 tons of current and 1618 tons of dump tailings were treated, yielding $132,699, the estimated net profits being $55,442.

Tepic

MIRAVALLES MINES CO.—The old Trinidad mine of the Huicicila group has been unwatered to a depth of 165 ft. below the tunnel level, and rich ore has been found in the old workings. The ore is rich in gold. The company will soon proceed with the reopening of the Huachapa mine, which was a greater producer than the Trinidad. The water rights on the Miravalles river have been denounced, and electric power for mining and milling will be developed.

Veracruz

CORONA PETROLEUM CO.—This company was recently organized as a subsidiary of the Royal Dutch-Shell company of Amsterdam. The capital is $5,000,000. Options on important oil lands and leases in the Tampico territory have been secured. Some time ago the Dutch interests opened negotiations with the Mexican Eagle Oil Co. (Pearsons) with a view to the acquisition of that company's holdings. The formation of the new company is taken to mean that the negotiations have been abandoned.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Feb. 26

The metal markets have been rather quiet. Copper has continued to decline in price, but very slowly, and business Catren is manager.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London was unchanged at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold arriving was taken for Egypt and India. Some European countries need gold, but are not yet willing to pay the premium needed to get it.

Iridium—Supplies continue short, with no prospect of an improvement. Dealers do not care to take much below $85 per oz., New York.

Platinum—The market is steady, both here and abroad, and prices are unchanged, dealers asking $45@46 per oz. for refined platinum. Hard metal is $49@52 per oz. according to iridium content.

Our Russian correspondent writes that the market and prices are steady. Quotations are unchanged at 9.70 rubles per zolotnik at Ekaterinburg and 37,700 rubles per pood at St. Petersburg—equal to $36.47 and $36.95 per oz. respectively—for crude metal, 83% platinum. No metal is being offered at Ekaterinburg, owing to the extreme cold which has stopped work in the placers, and the position is expectant rather than active. The government has suspended the operation of the new law prohibiting the export of crude platinum from Russia.

Silver—Owing to heavy sales by China banks silver has had a severe decline. The probability is that these sales are made for the purpose of putting the Exchange rates in a more favorable condition to further the bank's plans in the China loans. Meantime a squeeze is in operation in India, brought on by short silver sales against settlements, and covering contracts maturing this month.

Exports of Silver from London to the East Jan. 1 to Feb. 13, reported by Mesrs. Pixley & Abell:

	1912	1913	Changes
India	£1,076,800	£1,097,000	I. £ 20,20
China	400,000	65,000	D. 335,00
Total	£1,476,800	£1,162,000	D. £314,80

Exports of gold from London to India were £194,000 for the week; they were £1,074,000 for the month of January.

United States Gold and Silver movement in January as reported by the Bureau of Foreign and Domestic Commerce:

	Gold		Silver	
	1912	1913	1912	1913
Exports	$1,915,202	$17,237,648	$6,027,905	$6,435,914
Imports	5,141,243	6,210,343	4,358,009	4,199,571
Excess	I. $3,226,041	E. $11,027,305	E. $1,669,896	E. $2,236,343

Exports of merchandise in January are valued by the bureau at $227,020,645; imports, $162,678,516; excess of exports, $64,342,129. Adding excess of exports of gold and silver, brings the export balance for the month up to $77,605,527 in all.

Copper, Tin, Lead and Zinc

Copper—Business during the week of Feb. 20-26 has been relatively light, which was only natural after the large business of the previous week. Consumers both here and abroad have supplied their near-by wants and are disposed to await developments. On the other hand, sellers of copper appear to be quite comfortable and do not seem to be disposed to bring out business by offering further concessions. Some speculative lots have been forced on the market at unduly low prices, but the quantities involved were relatively small. Most of the business reported by first hands has been with European buyers, domestic sales having been apparently small. However, there is reason to believe that transactions with domestic manufacturers have been made by one producing interest on terms that are kept quiet. On Feb. 20 most of the agencies nominally raised their price to 15c., delivered, usual terms, which was widely heralded in the newspapers. While 14⅞@15c. has been maintained during the week as the price asked and has been the figure named by the respective agencies, or some of them, when asked to quote, a bid of 14¾c. at any time would secure what copper was wanted. Offers to sell at 14¾c., delivered in Connecticut, have failed to develop business. Indeed, that price has been materially shaded. Sales to Europe have been made on terms netting 14.40c. cash, New York, and even less than that. But relatively little business appears to have been done in Lake copper. One lot of a special brand is reported sold at 15c., but ordinary prime brands have sold at about 14.75@14.80 cents.

Although the copper market during the last week has failed to show any improvement in price and a good deal of pessimism still prevails, there is a stronger undertone. Certain sellers who during the latter part of the previous week were slashing prices in competitive selling have during the last week withdrawn from the market, not caring to

DAILY PRICES OF METALS

NEW YORK

Feb.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
20	4.8720	61⅜	14⅝@14⅞	14.40@14.50	48½	4.30@4.35	4.15@4.20	6.07½@6.22½	5.92½@6.07½
21	4.8735	61⅜	14⅝@14⅞	14.40@14.50	48½	4.30@4.35	4.15@4.20	6.07½@6.22½	5.92½@6.07½
22	.....	...	.....	.....	...	.....	.....	.....	.....
24	4.8735	61	14⅝@14⅞	14.40@14.50	47⅞	4.30@4.35	4.15@4.20	6.07½@6.22½	5.92½@6.07½
25	4.8745	60⅞	14⅝@14⅞	14.40@14.50	47¾	4.30@4.35	4.15@4.20	6.07½@6.22½	5.92½@6.07½
26	4.8745	60½	14⅝@14⅞	14.40@14.50	48	4.30@4.35	4.15@4.20	6.07½@6.22½	5.92½@6.07½

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. belo w that of electrolytic. The quotations for lead represent wholesale transactionsin the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Silver quotations are in cents per troy ounce of fine silver.

LONDON

Feb.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
20	28⅜	64¼	64¼	70	218	214	16⅛	25
21	28⅜	64⅜	64⅜	70	218½	214¾	16⅛	25
22	28 1/16	....	....	....	....	....	....	....
24	28 1/16	64⅜	64⅜	70	215¾	210¾	16⅛	25
25	27 15/16	64	64	69½	215	208	16⅛	25
26	27 15/16	64	64⅛	69	217	210½	16⅛	25

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb, except silver which is in pence pertroy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, pot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

make any more sales on present terms. The close is steady at 14⅝@14⅞c. for Lake copper, and 14.40@14.50c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 14.30@14.35c. as an average for the week.

The London standard market was under pressure throughout the week, but at the low level which has been reached prices offer considerably more resistance, and in consequence fluctuations have been within narrow limits. The close is £64 for spot, and £64 2s. 6d. for three months.

Base price of copper sheets is now 22@23c. per lb. Full extras are charged, and higher prices for small quantities. Copper wire is 16¼@16½c. base price, carload lots at mill.

Copper exports from New York for the week were 4877 long tons. Our special correspondent gives the exports from Baltimore at 270 tons for the week.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Oct.	Nov.	Dec.	Jan.
Alaska shipments	1,435,235	1,671,367	3,766,029	1,668,328
Anaconda	25,250,000	24,250,000	23,400,000	20,900,000
Arizona, Ltd	3,200,000	3,000,000	3,100,000	3,100,000
Copper Queen	8,184,575	8,807,940	8,805,568	7,554,966
Calumet & Arizona	4,404,000	4,918,000	5,840,000	4,750,000
Chino	3,638,500	3,911,169	3,368,850	2,903,030
Detroit	1,934,828	1,968,620	2,389,875	1,769,071
East Butte	1,398,177	1,245,504	1,314,021	.....
Mammoth	1,883,283	1,805,869	.....	.....
Giroux	*nil*	*nil*	625,000	.....
Mason Valley	1,563,700	1,500,000	1,550,000	1,575,100
Nevada Con.	850,741	4,160,533	3,975,631	.....
Ohio	187,141	573,644	566,816	.....
Ould Dominion	2,523,000	2,758,000	2,727,000	.....
Ray	3,403,755	3,191,926	3,638,500	3,610,000
Shannon	1,209,804	1,435,709	1,361,420	1,232,000
South Utah	*nil*	*nil*	*nil*	.....
United Verde*	2,750,000	2,900,000	3,000,000	.....
Utah Copper Co	2,022,352	4,562,417	5,676,484	7,182,495
Lake Superior*	21,500,000	20,400,000	18,300,000	17,500,000
Non-rep. mines*	8,250,000	8,250,000	.....	.....
Total production	95,588,091	97,310,698	.....	.....
Imports, bars, etc	28,205,270	22,797,099	.....	.....
Total blister	123,793,761	120,107,797	.....	.....
Imp. in ore and matte	11,224,879	8,149,728	.....	.....
Total American	135,018,640	128,248,525	.....	.....
Miami†	2,577,750	2,972,000	2,913,840	2,932,369
Brit. Col. Cos.:				
British Col. Copper	1,022,904	881,582	.....	.....
Granby	2,018,424	1,852,896	.....	1,792,245
Mexican Cos.:				
Boleo†	2,612,400	2,315,040	2,480,240	2,658,880
Cananea	4,428,000	5,064,000	4,592,000	.....
Moctezuma	3,045,667	2,112,377	2,793,781	2.913,294
Other Foreign:				
Braden, Chile	1,148,000	1,028,000	910,000	1,484,000
Cape Cop., S. Africa	757,120	907,200	770,560	770,540
Kyshtim, Russia	.....	.....	.....	.....
Spassky, Russia	974,000	974,400	974,400	.....
Tilt Cove, Newfoundland	86,785	.....	.....	.....
Exports from				
Chile	8,512,000	4,816,000	7,392,000	.....
Australia	9,520,000	10,752,000	9,856,000	.....
Arrivals in Europe$	13,771,520	12,976,320	16,363,200	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.
$ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
I, 1912.	119,337,753	62,343,901	80,167,904	89,454,695	158,323,200	247,777,895
II.	116,035,809	56,228,368	63,148,096	66,280,643	154,851,200	221,131,843
III.	125,694,601	67,487,466	58,779,566	62,939,988	141,142,400	204,082,387
IV.	125,464,644	69,513,846	53,252,326	62,367,557	136,819,200	199,186,757
V.	126,737,836	72,702,277	69,485,945	65,066,029	134,176,000	199,242,029
VI.	122,315,240	66,146,229	61,449,650	49,615,643	117,801,600	167,417,244
VII.	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	.....	.....	.....	123,198,332	77,504,000	200,702,332

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

A director of the American Smelting & Refining Co. is quoted as saying that the copper sales of that company during the week of Feb. 13-19 aggregated between forty and fifty million pounds.

Tin—The bears had it all their own way in the London market, where they attacked especially the future position, with the result that prices declined rapidly. There were rumors afloat that the selling originated with the large Vienna operators, and transactions were very heavy. There were some transactions in future tin in this market at very low prices, but the rank and file of consumers do not appear in the present state of the market to be interested in purchases. Spot and near-by tin seem to be scarce and commanding quite a premium. The market closes weak at £217 for spot, and £210 5s. for three months, and 48c. for February tin in New York.

Lead—The market is unchanged at 4.15@4.20c. St. Louis, and 4.30@4.35c. New York. A good business is reported.

The London market after a slight rally closes unchanged at £16 7s. 6d. for Spanish and 7s. 6d. higher for English.

A director of the American Smelting & Refining Co. is quoted as saying that that company has oversold its lead production for March and has practically no stock of lead on hand, whereas at this time last year the company had about 50,000 tons in stock.

Spelter—A rather large tonnage was sold during the last week, one of the principal consumers having been in the market, the bulk of the sales being for March delivery and fetching 5.92½@6c., averaging about 5.95c. A smaller tonnage for prompt delivery was sold at 6.07½c. Certain producers, who have disposed of liberal quantities of spelter on the decline, have now withdrawn as sellers and the spelter market is assuming a little stronger look. We quote 5.92½@6.07½c., St. Louis, and 6.07½@6.22½c. New York, according to delivery.

The London market is unchanged at £25 for good ordinaries and £25 7s. 6d. for specials.

Base price of zinc sheets was again lowered ¼c. on Feb. 26, and is now $8.25 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Other Metals

Aluminum—There has been some pressure for deliveries on contracts which makers have been unable to meet. The consequence has been quite a rush to buy, with higher prices offered. It is reported that a bid of 26c. for 1000 tons was refused. The market has rather a wide range and we quote 26@27c. per lb. for No. 1 ingots, New York.

Antimony—Business has been rather slack with small sales. Prices are practically unchanged, 9¼@9½c. per lb. being asked for Cookson's and 8⅞@9¼ for Hallett's; while 8⅛@8⅜c. is paid for Chinese, Hungarian and other outside brands.

Quicksilver—The market has been quiet, almost dull; prices are nominally unchanged, though inclined to be soft. New York quotation is $40 per flask of 70 lb., with 59c. per lb. asked for retail lots. San Francisco, $40 for domestic orders and $37.50 for export. London price is £7 15s. per flask, with £7 7s. 6d@£7 10s. quoted by jobbers.

Zinc and Lead Ore Markets

JOPLIN, MO.—Feb. 22

Prices of zinc blend were generally advanced $1 per ton; the high price is quoted at $52 and the base per ton of 60% zinc $45@49. Calamine sold on a base range of $25@28 per ton of 40% zinc. The average price of all grades of zinc is $43.84. Lead sold as high as $53.50, the base remaining unchanged at $53 per ton of 80% metal contents. The average of all grades is $52.74 per ton.

SHIPMENTS, WEEK ENDED FEB. 22

	Blende	Calamine	Lead Ore	Value
Totals	8,316,720	931,710	1,521,310	$243,929
Two months	86,835,920	5,078,820	15,049,050	$2,660,311

Blende value, the week, $191,092; 2 months, $2,187,295.
Silicate value, the week, $12,707; 2 months, $77,646.
Lead value, the week, $40,130; 2 months, $395,370.

PLATTEVILLE, WIS.—Feb. 22

The base price paid this week for 60% zinc ore ranged from $44 to $49. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED FEB. 22

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,032,400	220,790	1,521,800
Year to date	25,325,470	1,029,340	8,661,150

Shipped during week to separating plants, 2,653,140 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Feb. 26

The iron trade position cannot be said to show much change. This is the lull or quiet period between the heavy buying movement of December and the next rush which may come in March, perhaps later.

The weak point in the market is pig iron. Sellers seem to realize that they worked up the market too high and are now willing to make concessions of 50c. on their high prices to secure contracts. This is especially the case with Southern furnaces. A good deal of business is being done in foundry iron in a quiet way in Seaboard territory. Basic pig is less active.

In finished material the more active lines are structural material, with plates and shapes for car and bridge building. In other lines new orders are not heavy. The rush at the mills continues, all being busy and in many cases unable to keep up fully with their deliveries.

Prices remain practically unchanged, and not much variation seems probable for a time.

German Iron Production in January is reported as follows, in metric tons: Foundry, 300,050; forge, 42,818; steel pig, which includes spiegeleisen, ferromanganese and all similar alloys, 215,642; bessemer pig, 33,711; Thomas or basic pig. 1,017,493; total 1,609,714 tons, which is 224,221 tons more than in January of last year.

PITTSBURGH—Feb. 25

The steel trade has reflected in only very slight degree the slowing down which has occurred in many lines of activity since the first of the year, and certainly not enough to disturb the prospect of full operation for months to come. Specifications have been almost equal to shipments in the past two months, an excellent showing for the season, and the tonnage assured, but not actually specified, is very large, including rails, structural work and car material. The decline in foundry pig iron continues, whereas steel-making pig iron has been practically stationary, thus reflecting the good conditions in steel proper. Stocks of foundry iron have increased since the first of the year, and as buyers show no disposition to buy until their contracts are exhausted, further though perhaps slight declines are likely in foundry iron.

Several of the independent steel interests are actively soliciting steel bar contracts for second half at the regular price of 1.40c., but the leading interest is holding aloof, though selling in urgent cases. Premiums on plates for early shipment have greatly decreased and are now moderate, while the basis price remains firm at 1.45c. on both plates and shapes.

Pig Iron—The market has been extremely dull, and prices are not quotably changed. The steel works furnaces have been running under high pressure for months, and some of the large interests may have to come into the market within a few months, while the steel mills which have no furnaces have little iron ahead and are expected to be forced to buy freely soon, so that the prospect is for a fairly good market in bessemer and basic, while foundry iron is dull and has been declining in all markets. Connellsville coke has stiffened up somewhat, and $2.50 is regularly quoted for prompt, while it is a question whether operators would sell on contract at this figure. We continue to quote: Bessemer, $17.25; basic, $16.35; No. 2 foundry, $17; forge, $16.50; malleable, $17, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market has been extremely quiet, with small prompt lots sometimes offered at concessions from the contract price. Consumers seem to be well covered to July 1, while those not covered through second half are slow in placing contracts. We continue to quote contracts at $65, Baltimore.

Steel—Deliveries of sheet bars have slightly improved, and mills are now losing little time through insufficient supply. There has been no increase in the offerings, though there is a rumor that one of the large steel interests is offering limited tonnages for second quarter. The general expectation is that offerings for third quarter will be materially larger, on account of new capacity. The Edgar Thomson openhearth extension is expected to be in operation by July 1, as is also the openhearth plant the Youngstown Sheet & Tube Co. has been building. We continue to quote the market nominally at $29 for billets, $30 for sheet bars and $30 for rods, f.o.b. maker's mill, Pittsburgh or Youngstown.

Sheets—There are rumors of price irregularities in the Chicago district, but nothing of the sort is noticed in the Pittsburgh-Valley district, where mills are running full with ample specifications ahead. The American Sheet & Tin Plate Co. has increased the extra on enameling stock from 15 to 25c. per 100 lb., this being a special grade of tin mill sizes furnished in squares, pickled and cold rolled, on which the extra cost of manufacture is held to be much greater than the differential hitherto charged. The market is firm at former base prices, with occasional premiums for quick shipment: Blue annealed, 10 gage, 1.75c.; black, 28 gage, 2.35c.; galvanized, 28 gage, 3.50c.; painted corrugated, 28 gage, 2.55c.; galvanized, 3.55c., per pound.

IRON ORE

The market for Lake ores has been quiet. Little or no business has been closed on the low-grade ores, which are about all that have not been taken up. On these there might be slight concessions made.

Iron Ore Trade of Germany year ended Dec. 31, metric tons:

	Imports		Exports	
	1911	1912	1911	1912
Iron ores	10,820,485	12,120,090	2,582,081	2,309,628
Manganese ores	420,769	523,125	9,667	7,117

Imports of ore were chiefly from Sweeden, Spain, France and Russia; exports to Belgium and France.

COAL TRADE REVIEW

NEW YORK—Feb. 26

The coal trade is generally quiet with fair supplies and prices about holding firm. The conditions are the same both in the West and on the Seaboard. The anthracite trade has about reached a state of equilibrium between demand and supply, thanks to the mild winter. The season for making yearly contracts is on and the usual discussions over prices are to be expected.

British Columbia Coal production in 1912 is reported as follows, in long tons, by districts:

	Mined	Used for Coke	Sold as Coal	Coke made
Vancouver Island	1,513,304	.....	1,513,304	.....
Nicola and Similkameen	213,933	.....	213,933	.....
Crow's Nest	1,299,163	395,372	903,791	264,136
Totals	3,026,400	395,372	2,631,028	264,136

The average quantity of coal used in making a ton of coke was 1.49 tons. No coke was made on Vancouver Island, the plant at Union Bay having been idle all the year.

Belgian Foreign Coal Trade for the year ended Dec. 31 was, in metric tons:

	Imports		Exports	
	1911	1912	1911	1912
Coal	7,326,563	8,119,956	5,169,523	5,064,286
Coke	691,837	957,743	1,026,921	1,014,796
Briquettes	383,224	438,887	530,118	623,355
Totals	8,401,624	9,516,586	6,726,562	7,702,407

The imports exceeded the exports by 1,675,062 tons in 1911 and by 1,814,179 tons last year.

CHEMICALS

NEW YORK—Feb. 26

The general market is good and business is large in most lines.

Arsenic—Dullness continues and there is little business. Prices are unchanged, $4.25@4.50 per 100 lb. being asked.

Copper Sulphate—Trade is good and prices are unchanged at $5.25 per 100 lb. for carload lots and $5.50 for smaller orders.

Nitrate of Soda—Quotations are: Spot, March and April, 2.62½c.; May, 2.60c.; June, 2.57½c.; July, 2.55c. The spring trade is beginning to show, and business is good.

PETROLEUM

Exports of mineral oils from the United States in January were: Crude petroleum, 14,083,986 gal.; illuminating oil, 91,059,036; lubricating and paraffin, 18,808,060; naphthas, gasoline, etc., 7,056,904; residuum and fuel oil, 34,565,483; total, 165,573,059 gal., an increase of 34,865,957 gal., or 26.7%, over January of last year

Assessments

Company	Delinq	Sale	Amt.
Advance, Ida	Mar. 15	Apr. 15	$0.003
Cedar Talesman, Utah			0.01/2
Coeur d'Alene Vulcan, Ida.	Mar. 2	Mar. 22	0.005
Columbus Ext., Utah	Feb. 13	Mar. 13	0.01
Consolidated Virginia, Nev.	Feb. 11	Mar. 4	0.15
Corbin Copper, Mont.		Apr. 22	0.50
Crown Point, Utah	Mar. 20	Apr. 15	0.01/2
East Hercules Ext., Wash.		Mar. 15	0.001/2
Hypotheek, Ida	Feb. 21	Mar. 14	0.01/2
Melcher, Utah	Feb. 11	Mar. 3	0.02
New York Bonanza, Utah			0.03/2
Pacific Quicksilver, Calif.	Mar. 5		0.03
Powhattan, Ida	Feb. 3	Mar. 3	0.00/2
Pine Tree M. & M.	Feb. 17	Mar. 7	0.03/2
Ploche Metals, Nev.	Feb. 10	Mar. 17	0.01
Rescue Eula, Nev.	Feb. 5	Mar. 5	0.01/2
Revenue, S. D.			0.003
Robbers' Roost, Calif.	Feb. 4	Mar. 1	0.03/2
Rockford, Ida	Feb. 17	Mar. 8	0.001
Roy M. & M., Utah	Feb. 20	Mar. 8	0.01/2
Spring Lake, Utah	Feb. 24	Mar. 15	0.001
Tintic Central, Utah	Mar. 11	Mar. 29	0.01/2
Utah, Nev	Feb. 25	Mar. 18	0.05
Western Star, Ida	Feb. 12	Mar. 8	0.002

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	.....	24.081	27.190	.....
March	52.745	58.375	.....	24.324	26.875	.....
April	53.325	59.207	.....	24.595	27.284	.....
May	53.308	60.880	.....	24.583	28.038	.....
June	53.043	61.290	.....	24.486	28.215	.....
July	52.630	60.654	.....	24.286	27.919	.....
August	52.171	61.606	.....	24.082	28.375	.....
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	.....	14.329	.....	62.893	.....
March	14.698	.....	14.868	.....	65.884	.....
April	15.741	.....	15.930	.....	70.294	.....
May	16.031	.....	16.245	.....	72.352	.....
June	17.234	.....	17.443	.....	78.259	.....
July	17.190	.....	17.353	.....	76.636	.....
August	17.498	.....	17.644	.....	78 670	.....
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	12.962	.....	195.036	.....
March	12.577	.....	192.619	.....
April	43.923	.....	200.513	.....
May	16.063	.....	208.830	.....
June	45.815	.....	205.863	.....
July	44.519	.....	202.446	.....
August	45.857	.....	208.351	.....
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	.....	3.946	.....	15.738	.....
March	4.073	.....	4.046	.....	15.997	.....
April	4.200	.....	4.118	.....	16.331	.....
May	4.194	.....	4.072	.....	16.509	.....
June	4.392	.....	4.321	.....	17.588	.....
July	4.720	.....	4.603	.....	18.544	.....
August	4.569	.....	4.452	.....	19.655	.....
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	.....	6.349	.....	26.661	.....
March	6.626	.....	6.476	.....	26.048	.....
April	6.633	.....	6.483	.....	25.644	.....
May	6.679	.....	6.529	.....	25.790	.....
June	6.877	.....	6.727	.....	25.763	.....
July	7.116	.....	6.966	.....	26.174	.....
August	7.028	.....	6.878	.....	26.443	.....
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	.....	13.28	.....	14.01	.....
March	14.95	.....	13.66	.....	14.10	.....
April	15.13	.....	13.90	.....	14.15	.....
May	15.14	.....	13.90	.....	14.12	.....
June	15.15	.....	14.11	.....	14.22	.....
July	15.15	.....	14.38	.....	14.38	.....
August	15.43	.....	14.90	.....	14.85	.....
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Feb. 25

Name of Comp.	Bid.
Acacia	.03
Cripple Cr'k Con.	.01/4
C. K. & N.	.10
Doctor Jack Pot.	.05
Elkton Con.	.60
El Paso	5.76
Findlay	.04/2
Gold Dollar	.11
Gold Sovereign	.02/8
Isabella	.11
Jack Pot	.05/2
Jennie Sample	.05/2
Lexington	‡.008
Moon Anchor	‡.005
Old Gold	.02/8
Mary McKinney	.63
Pharmacist	.01/2
Portland	.98
Vindicator	99/8
Work	‡.004

SALT LAKE Feb. 25

Name of Comp.	Bid.
Beck Tunnel	.09/2
Black Jack	.09
Cedar Talisman	.00/3
Colorado Mining	.13
Columbus Con	.12
Crown Point	.02/4
Daly-Judge	6.00
Grand Central	.76
Iron Blossom	1.32/2
Little Bell	‡.10
Lower Mammoth	.04
Mason Valley	7.50
May Day	.12/2
Nevada Hills	1.02/2
New York	‡.005
Prince Con	.67
Silver King Coal'n	2.97/2
Sioux Con.	.03
Uncle Sam	.03
Yankee	.13

TORONTO Feb. 25

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.09/2	Foley O'Brien	.23
Coniagas	.08	Hollinger	15.68
T. & Hudson Bay.	69.00	Imperial	.02/4
Timiskaming	.40	Jupiter	.38
Wettlaufer-Lor.	.11	Pearl Lake	.55/2
Apex	.02/8	Porcu. Gold	.23
Crown Chartered.	.01/2	Preston E. D.	‡.03
Dobie	‡.25	Rea	.30
Dome	‡18.00	Swastika	.11/4
Dome Exten.	.08/2	West Dome	.18

SAN FRANCISCO Feb. 25

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	‡.03
Belcher	.17
Best & Belcher	.03
Caledonia	.75
Challenge Con.	.05
Chollar	.01
Confidence	‡.30
Con. Virginia	.23
Crown Point	.20
Gould & Curry	.02
Hale & Norcross	.07
Mexican	.74
Occidental	.70
Ophir	.22
Overman	.22
Potosi	.03
Savage	.04
Sierra Nevada	.17
Union Con	.11
Yellow Jacket	.25

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	7.00
Jim Butler	.71
MacNamara	.20
Midway	.56
Mont.-Tonopah	1.60
North Star	.21
West End Con.	1.32/2
Atlanta	.16
Booth	.03
C.O.D. Con	.06
Comb. Frac.	.06
Jumbo Extension	.31
Pitts.-Silver Peak	.60
Silver Pick	.06
St. Ives	.30
Tramp Con	‡.01
Argonaut	2.00
Bunker Hill	1.50
Central Eureka	.15
So. Eureka	2.50

N. Y. EXCH. Feb. 25

Name of Comp.	Clg.
Amalgamated	66
Am. Agri. Chem.	51
Am.Sm.&Ref.,com	66 7/8
Am. Sm. & Ref., pf.	103 1/2
Am. Sm. Sec., pf. B	85
Anaconda	34
Batopilas Min.	1 1/8
BethlehemSteelpf	64 1/2
Chino	37
Federal M. &S., pf.	36 3/4
Goldfield Con.	2 1/4
GreatNor.,ore.,ctf.	34
Guggen. Exp.	43 1/2
Homestake	116
Inspiration Con.	15 3/4
Miami Copper	22
Nat'nalLead,com.	48 1/4
National Lead, pf.	104 1/2
Nev. Consol.	16 1/4
Phelps Dodge	200
Pittsburg Coal, pf.	84 7/8
Ray Con	17 1/8
RepublicI&S,com.	24 3/4
Republic I & S, pf.	83
SlossSheffi'd,com.	35
Sloss Sheffield, pf.	91 3/4
Tennessee Copper	34 1/2
Utah Copper	51 1/4
U. S. Steel, com	60
U. S. Steel, pf.	107 3/4
Va.Car. Chem., pf.	107 7/8

N. Y. CURB Feb. 25

Name of Comp.	Clg.
Barnes King	‡.85
Beaver Con	.40
Braden Copper	8
B. C. Copper	3 1/2
Buffalo Mines	2 1/16
Caledonia	‡.40
Con. Ariz. Sm.	3/8
Davis-Daly	1
Diam'field-Daisy	.05
Ely Con	.11
Florence	.43
Giroux	2 9/16
Gold Hill Con.	‡1/8
Greene Cananea	7 5/8
Greenwater	.05
Internat. S. & R.	117
Kerr Lake	3 1/4
Keystone	‡2
La Rose	2 3/4
McKinley-Dar-Sa.	2 7/8
Min. Co. of A. new	2 3/4
Motherlode Gold.	‡.60
Nev. Utah M. & S.	‡.01
Nipissing Mines	8 3/4
Ohio Copper	1 1/2
Pacific Sm. & M.	7/8
Puebla S. & R.	2 1/8
South Live Oak	‡2
South Utah M. &S.	‡3/4
Standard Oil (Old)	1110
Stand'd Oil of N.J.	373
Stewart	1 1/16
Tonopah	5 3/4
Tonopah Ex.	1 3/4
Tonopah Merger	.84
Tri-Bullion	1/2
Tularosa	3/4
Union Mines	‡1/8
United Cop., pfd.	10
Yukon Gold	3

LONDON Feb. 26

Name of Com.	Clg.
Camp Bird	£0 19s 6d
El Oro	0 17 6
Esperanza	1 9 6
Mexico Mines	‡6 10 0
Oriental Con.	1 17 3
Oroville	0 17 0
Santa Gert'dis	1 5 3
Tomboy	1 7 6

BOSTON EXCH. Feb. 25

Name of Comp.	Clg.
Adventure	3 1/2
Ahmeek	280
Algomah	1 1/2
Allouez	34 1/2
Am. Zinc	29
Ariz. Com., ctfs.	3
Bonanza	.40
Boston & Corbin	5 1/2
Butte & Balak	2 1/2
Calumet & Ariz.	59 3/4
Calumet & Hecla	435
Centennial	13
Cliff	‡1 3/4
Copper Range	43
Daly West	‡3 1/2
East Butte	12
Franklin	5 7/8
Granby	56
Hancock	17 1/2
Hedley Gold	30 1/2
Helvetia	‡3/4
Indiana	107
Island Cr'k, com.	51
Island Cr'k, pfd.	84
Isle Royale	25
Keweenaw	2 1/2
Lake	14
La Salle	4
Mass	4 1/2
Michigan	‡1 1/4
Mohawk	47 3/4
New Arcadian	2
New Idria Quick.	‡6
North Butte	24 1/2
North Lake	1 3/4
Ojibway	2
Old Dominion	45
Osceola	85
Quincy	65 1/4
Shannon	10 1/2
Shattuck-Ariz.	22
Superior	26
Superior & Bost.	3 1/8
Tamarack	26
Trinity	4 1/4
Tuolumne	2 3/4
U. S. Smelting	38 3/4
U. S. Smelt'g, pf.	48
Utah Apex	1 3/4
Utah Con	9
Victoria	1 1/2
Winona	2 3/8
Wolverine	64
Wyandot	.90

BOSTON CURB Feb. 25

Name of Comp.	Last
Alaska Gold M.	18
Bingham Mines	4
Boston Ely	.65
Boswyocolo	‡.01
Butte Central	7 3/8
Cactus	.06
Calaveras	2 7/8
Chief Cons	1 1/2
Corbin	.64
Cortez	.35
Crown Reserve	3 5/8
Eagle & Blue Bell.	.96
First Nat. Ccp.	1 3/4
Majestic	.43
Mexican Metals	1 1/8
Moneta Porc.	.06
Nevada-Douglas.	2 3/8
New Baltic	.80
Oneco	1 1/2
Raven Copper	.16
Rhode Island Coal	.06
Smokey Dev.	1 3/4
S. W. Miami	2 1/2
South Lake	6 1/2
Trethewey	.40
United Verde Ext.	.65

‡Last quotation.